

Course guide

330807 - AII - Automation of Industrial Installations

Last modified: 02/09/2026

Unit in charge: Manresa School of Engineering
Teaching unit: 750 - EMIT - Department of Mining, Industrial and ICT Engineering.

Degree: MASTER'S DEGREE IN INDUSTRIAL FACILITY DESIGN AND MANAGEMENT (Syllabus 2026). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 5.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Enric Bonet Gil

Others:

PRIOR SKILLS

Mathematics and physics applied to engineering
Dynamic systems and basic balances
Electrical systems and industrial automation
Interpretation of industrial diagrams and installations

REQUIREMENTS

There are not specific requeriments

TEACHING METHODOLOGY

The sessions combine lectures, applied examples, and the analysis of real industrial installation case studies. Practical activities are based on the interpretation, adaptation, and integration of automation, supervision, and supervisory control systems, using tools such as Node-RED, Rapid SCADA, MQTT, Grafana, Python, and Matlab as educational support tools. Autonomous work is mandatory and includes guided activities, preparation of practical assignments, and the progressive development of the final project.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course, students will be able to:

- M3.K1. Describe the fundamental concepts of control technology, industrial automation, and industrial communications, as well as their operation.
- M3.K2. Describe the operation of measurement instruments used in industrial automation and system condition monitoring.
- M3.S1. Evaluate the characteristics of an industrial installation for its subsequent control and supervision.
- M3.C1. Develop integrated automation, supervision, maintenance, and diagnostic applications for industrial environments, based on data analysis and process modelling, to support objective, responsible, and ethical decision-making.

STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	100.00

Total learning time: 45 h

CONTENTS

Introduction to Automation in Industrial Installations

Description:

The course introduces the fundamental concepts of automation applied to industrial installations, including system dynamics, industrial regulation, automated system architectures, PLCs, SCADA systems, and supervisory control. Industrial data management and the functional integration of sensors, controllers, and monitoring and decision-support platforms are also addressed.

Specific objectives:

Understand the operation of industrial automated systems.

Interpret local and supervisory control strategies.

Analyze the relationship between system dynamics, regulation, and system architecture.

Understand the role of PLCs and SCADA systems within an industrial installation.

Evaluate the importance of data in supervision and technical decision-making.

Related activities:

Lectures, problem-solving sessions, guided practical activities, and development of an integrated industrial automation and supervision project.

Full-or-part-time: 125h

Theory classes: 33h

Guided activities: 12h

Self study : 80h

ACTIVITIES

Practical activities: problem-solving exercises

Description:

Problem-solving exercises and guided practical activities related to industrial automation, local control, supervision, and process data interpretation.

Specific objectives:

Apply automation, supervision, and control concepts in industrial installations.

Material:

Course notes, technical documentation, Matlab, Node-RED, MQTT, Grafana, and Python.

Delivery:

Submission of exercises and practical reports.

Full-or-part-time: 60h

Guided activities: 10h

Self study: 50h



Integrated project: supervisory control in an industrial installation

Description:

Development of an integrated project focused on the conceptual design of an industrial automated system, including supervision, monitoring, data management, and support for technical decision-making.

Specific objectives:

Integrate local control, supervision, data management, and industrial architecture concepts within an applied automation case study.

Material:

Technical documentation, course notes, open-source software tools, and course resources.

Delivery:

Submission of a technical report and final project presentation.

Full-or-part-time: 32h

Guided activities: 2h

Self study: 30h

Written exam

Description:

Individual assessment aimed at evaluating the understanding of the fundamental concepts related to industrial automation, regulation, supervision, and automated system architectures.

Specific objectives:

Assess the understanding of the basic concepts of automation, regulation, supervision, and control in industrial installations.

Material:

Course notes, technical documentation, and material provided during the course.

Delivery:

In-person completion of the written exam.

Full-or-part-time: 2h

Theory classes: 2h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the [Action Framework for Academic Integrity in Assessment at the UPC](#).

The final grade will be calculated according to the following weighting:

Practical assignments and applied activities: 50%.

Integrated project: 30%.

Written exam: 20%.

To pass the course, students must obtain a final grade equal to or higher than 5.0. In addition, a minimum grade of 4.0 in the integrated project will be required.

EXAMINATION RULES.

Assessment tests and evaluation activities will be carried out on the dates established by the teaching staff and communicated through Atenea. Practical assignments and the project must be submitted within the indicated deadlines. Late submissions will only be accepted in justified cases. Copying, plagiarism, or the unauthorized use of materials will result in the application of the current academic regulations of UPC.

BIBLIOGRAPHY

Basic:

- Nise, Norman S.. Control systems engineering. Wiley, 2011. ISBN 9780470646120.
- Piedrafita Moreno, Ramón. Ingeniería de la automatización industrial. 2a ed. ampl. y act. Paracuellos de Jarama, Madrid: Ra-ma, cop. 2004. ISBN 8478976043.
- Rodríguez Penin, Aquilino. Sistemas SCADA : guía práctica. Barcelona: Marcombo, 2007. ISBN 9788426714558.
- Roca Cusidó, Alfredo. Control automático de procesos industriales : con prácticas de simulación y análisis por ordenador PC. Madrid: Díaz de Santos, 2023. ISBN 9788490525111.

Complementary:

- Dunn, William C. Fundamentals of Industrial Instrumentation and Process Control [on line]. McGraw-Hill, 2019 [Consultation: 18/06/2026]. Available on: <https://www-accessengineeringlibrary-com.recursos.biblioteca.upc.edu/content/book/9781260122251>. ISBN 12601222-3.
- Fisher Controls International. Control valve handbook [on line]. 6th. Emerson Automation Solutions, 2019 [Consultation: 25/06/2026]. Available on: <https://instrumentationtools.com/wp-content/uploads/PDF/Books/Control%20Valve%20Handbook.pdf>.
- Ogata, Katsuhiko; Dormido Canto, Sebastián; Dormido Canto, Raquel. Ingeniería de control moderna [on line]. 5ª edición. Madrid: Pearson Educación, 2010 [Consultation: 18/06/2026]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=1259. ISBN 9788483229552.
- Luyben, William L. Process modeling, simulation, and control for chemical engineers. 2nd ed. New York ; Madrid [etc.]: McGraw-Hill, 1990. ISBN 0070391599.

RESOURCES

Other resources:

Matlab and Simulink for analysis and simulation of dynamic systems.
Node-RED for industrial data monitoring and integration.
MQTT as a lightweight industrial communication protocol.
InfluxDB and Grafana for data storage and visualization.
Python (pandas, numpy, matplotlib, and pymodbus) for supervision, data acquisition, and analysis.
Rapid SCADA as an example of an open-source SCADA platform.
Technical documentation from industrial manufacturers and IEC 61131-3 manuals.