Course guide
820142 - ACIE - Industrial Automation and Communications

Last modified: 02/10/2025

Unit in charge: Barcelona East School of Engineering
Teaching unit: 709 - DEE - Department of Electrical Engineering.

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Optional subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Optional subject).

Academic year: 2025 **ECTS Credits:** 6.0 **Languages:** Spanish

LECTURER

Coordinating lecturer: DANIEL ROMERO PEREZ

Others: Primer quadrimestre:
DANIEL ROMERO PEREZ - Grup: T11

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. Understand the basics of production and manufacturing systems.
2. Understand machine control and electric drives and their applications.
3. Understand the fundamentals of automatic control methods.
4. Understand automatic regulation and control techniques and their application to industrial automation.

Transversal:
6. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
9. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.
10. ENTREPRENEURSHIP AND INNOVATION - Level 3. Using knowledge and strategic skills to set up and manage projects. Applying systemic solutions to complex problems. Devising and managing innovation in organizations.
13. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.

TEACHING METHODOLOGY

Weekly there will be a theoretical session and a practical session in the laboratory with programmable controllers, HMI screens and computers.
The practices is a small project of an industrial process applicable in any factory, where the PLC, an HMI screen and a web page server with a database will be programmed.
The student will develop cooperative work outside of class

LEARNING OBJECTIVES OF THE SUBJECT

The objectives of this course are:
- Elementary knowledge of industrial control systems at the level of sensors, actuators and electrical safety elements.
- Select, specify, configure and use PLCs and communications for an automated production system.
- Know the main basic concepts of the programming of programmable automatons until reaching an advanced and professional programming methodology.
- Select, configure and define industrial communications networks.
- Understand the importance of MES systems, Industry 4.0 and the Internet of Things (IoT).

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Hours large group	45,0	30.00
Hours small group	15,0	10.00

Total learning time: 150 h

CONTENTS

(ENG) Introducció a l'automatització industrial

Description:
Preactuators, actuators and sensors. Symbology. Electric schemes.

Full-or-part-time: 4h
Theory classes: 4h

(ENG) Filosofia i aplicació de l'automat programable

Description:
Principles of operation. Structure. Architecture of programmable automata. Assembly of a system based on programmable automaton. Elements and types of cards for various applications.

Full-or-part-time: 5h
Theory classes: 5h

(ENG) Introducció a la programació d'automats.

Description:
Programming languages. Assignment of inputs and outputs. Representation formats. Logic instructions, counters, timers, comparisons. Application examples.

Full-or-part-time: 12h
Theory classes: 12h

(ENG) Operator screens HMI. SCADA programs.

Description:
Introduction to supervision. Monitoring. Visualization, introduction and registration of data (tags or variables). Representation of the process. Synoptic creation. alarms. Prescriptions. Animations. Script. Securities. Graphs and trends (trending). Historical and databases.

Full-or-part-time: 5h
Theory classes: 5h

(ENG) Industrial networks and communications. Field Buses, Local Networks and Remote Access.

Description:
Basic concepts: CIM pyramid and the ISO/OSI reference model. ASi, Interbus-S, Profibus DP/PA, DeviceNet protocols. ProfiNet, Ethernet IP, ModbusTCP and EtherCAT.

Full-or-part-time: 4h
Theory classes: 4h

(ENG) Practices.

Description:
Practice 1. Introduction to Unity pro.
Practice 2. Programming of a painting process.
Practice 3. Introduction to Vijeo Designer.
Practice 4. Manual orders through the screen terminal.
Practice 5. Representation of alarms on the screen.
Practice 6. Analog.
Practice 7. Configuration of an OPC.
Practice 8. Web server. SQL module in OPC.
Practice 9. Presentation of data on the web.

Full-or-part-time: 30h
Practical classes: 30h

GRADING SYSTEM

Practices: 40%
Project: 35% (50% text + 50% presentation)
Final exam: 25%

BIBLIOGRAPHY

Basic:
- Bouteille, D. [et al.]. Los automatismos programables. Rueil-Malmaison: CITEF, 1991. ISBN 2907314149.
- Bouteille, N. [et al.]. Le GRAFCET. Toulouse: Cépaduès, 1992. ISBN 271350631X.
- Boix i Aragonès, O., Saigí i Grau, M., Zabaleta i Alañà, F. Automatismes elèctrics programables. Barcelona: Edicions UPC, 1993. ISBN 8476533055.
- Piedrafita Moreno, R. Ingeniería de la automatización industrial. 2ª ed. Paracuellos de Jarama: Ra-Ma, 2004. ISBN 8478976043.