Course guide
820229 - SICIEIA - Information Systems and Industrial Communication

Last modified: 09/01/2026

Unit in charge: Barcelona East School of Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control.

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

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

LECTURER

Coordinating lecturer: PEDRO PONSA ASENSIO

Others:

Primer quadrimestre:
JAVIER FRANCISCO GÁMIZ CARO - Teoria
MARC LLUVA SERRA - Grup: T21, Grup: T22
MANUEL LOZANO GARCÍA - Grup: T23, Grup: T24

Segon quadrimestre:
PEDRO PONSA ASENSIO - Teoria; - Grup: M13, Grup: M14
FERRAN SANABRIA - Grup: M11, Grup: M12, Grup: M15, Grup: M16

REQUIREMENTS

CONTROL INDUSTRIAL I AUTOMATITZACIÓ - Precorequisit

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
2. Apply their knowledge to industrial informatics and communications.
3. Design automatic control systems.

Transversal:
06 URI N2. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.
1. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

TEACHING METHODOLOGY

The course uses the teaching class, case study, examples and exercises.
We recommend the schedule: first CIA, next SICI and finally Automated Systems Integration (ISA).

LEARNING OBJECTIVES OF THE SUBJECT

1. Enter the student the concepts of the diverse industrial communication techniques, terminology used, reference standards and programming protocols.
2. To enable the student / a to discern the functional characteristics of wireless communications and communication networks to plan based industrial field buses.
4. Enter the student / the basic concepts of systems Supervisory Control and Data Acquisition and enable the student / a to define and configure the functionality of the (input-output historical databases, synoptic charts, etc..).

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

(ENG) Tema 1: Introduction.

Description:
1.1. Control: manual, automatic, supervisory.
1.2. Interfaces: dashboard, HMI, SCADA.
1.3. Controller: PLC, industrial controller.
1.4. Examples of architectures: operator, interface, PLC
1.5. Communications media.
1.6. Transmission modes.
1.7. Methods of access to the media.
1.8. Reference models. OSI, TCP/IP.
1.9. Communications protocols. Error detection.

Specific objectives:
Student will be able to:
Classify and modelling of communications systems.

Related activities:
- Exam
- Exercises

Related competencies :
CEEIA-29. Design automatic control systems.
CEEIA-28. Apply their knowledge to industrial informatics and communications.
06 URI N2. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Full-or-part-time: 25h
Theory classes: 13h
Self study : 12h

(ENG) Tema 2: Local Area Networks

Description:
2.1. Network devices:router, switch.
2.2. Network topologies.
2.3. Field bus.
2.4. Ethernet/IP. Ethernet networks.
2.5. Gateway.
2.6. Wireless networks.
2.7. Tool: network traffic monitoring.

Specific objectives:
Students will be able to
Configure LAN networks and field buses in the A5.4 Laboratory

Related activities:
- Examen
- Exercises

Related competencies :
CEEIA-29. Design automatic control systems.
CEEIA-28. Apply their knowledge to industrial informatics and communications.
06 URI N2. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Full-or-part-time: 20h
Theory classes: 10h
Self study : 10h

(ENG) Tema 3: WAN networks

Description:
3.1. Virtual private networks VPN.
3.2. Network security techniques.
3.3. Firewall amb DMZ zone.
3.4. Cloud communications.
3.5. Cryptography and information encryption algorithms.
3.6. Example: remote access in LoRaWAN architecture.
3.7. Example: AI and SCADA.

Specific objectives:
The basic objectis is learn the basic concepts about information and communication related to LAN and WAN networks.

Related activities:
Exercises.
Examples.
Exam.

Full-or-part-time: 20h
Theory classes: 10h
Self study : 10h

(ENG) Tema 4: Information systems

Description:
4.1. Data, instrumentation and knowledge..
4.2. Data visualization with Python.
4.3. Time data analysis. Patterns.
4.4. Database and structured query language.
4.5. Machine learning with Python.
4.6. Online exercises using Colab.
4.7. KPIs, OEE and Dashboard examples.
4.8. Use of synthetic data examples.

Specific objectives:
Students will be able to:
data gathering, data processing, visualization of information, use of Python libraries for data science.

Related activities:
- Autonomous study
- Exercises in classsroom with laptop
- Exam

Related competencies :
CEEIA-29. Design automatic control systems.
CEEIA-28. Apply their knowledge to industrial informatics and communications.
06 URI N2. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Full-or-part-time: 24h
Theory classes: 12h
Self study : 12h

(ENG) Tema 5: Practices of Laboratory

Description:
PART I:

5.1. SCADA definition. Design and script programming SCADA applications.
5.2. PLC network with Ethernet over an assembly academic system.
5.3. SCADA-PLC and OPC comunications.
5.4. Information resources: references.

PART II:

5.5. Security communications with OPC UA.
5.6. SCADA- IIoT gateway communications.
5.7. SCADA communications with MQTT protocol.
5.8. Remote access and VPN.

Specific objectives:
Students will be able to:
acquire skills in advanced automation systems: PLC programming and configuration, communication protocols, SCADA application design.
use references.

Related activities:
- Autonomous study and group study,
- Exercises
- Searching for data sheets
- Laboratory practices

Related competencies :
CEEIA-29. Design automatic control systems.
CEEIA-28. Apply their knowledge to industrial informatics and communications.
06 URI N2. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

Full-or-part-time: 53h
Laboratory classes: 15h
Self study : 38h

GRADING SYSTEM

First exam: 30%
Second exam: 30%
Practice Lab I: 20%
Practice Lab II: 20%

EXAMINATION RULES.

The evaluation method of this course meets the current academic regulations to be qualified: NO REVALUABLE.
Laboratory practices are mandatory attendance.

BIBLIOGRAPHY

Basic:
- Valdivia Miranda, Carlos. Comunicaciones industriales. Madrid: Paraninfo, 2019. ISBN 9788428338653.
- Rodríguez Penin, Aquilino. Sistemas SCADA [on line]. 2a ed. Barcelona: Marcombo, 2012 [Consultation: 11/06/2020]. Available on: https://ebookcentral.proquest.com/lib/csuc-ebooks/detail.action?docID=3175459. ISBN 9788426714503.
- de Moura, Ralf Luis; Pires, Brenda Aurora; de Moura Filho, Ralf Luis. CONNECTED INDUSTRY: Principles of Industrial and IIOT Networks. Eliva Press, 2025. ISBN 978-9999327534.

Complementary:
- Angulo Bahón, Cecilio; Raya Giner, Cristóbal. Tecnología de sistemas de control [on line]. Barcelona: Edicions UPC, 2004 [Consultation: 29/09/2021]. Available on: http://hdl.handle.net/2099.3/36817. ISBN 8483017784.
- Postigo Palacios, Antonio. Seguridad informática. Madrid: Ediciones Paraninfo, S. A, 2020. ISBN 9788428344555.
- Valdivia Miranda, Carlos. Redes telemáticas. Madrid: Paraninfo, 2015. ISBN 9788428334877.
- Castro Gil, Manuel-Alonso. Comunicaciones industriales : sistemas distribuidos y aplicaciones. Unidades didácticas. Madrid: UNED, 2007. ISBN 9788436254679.
- Automática e instrumentación [on line]. Barcelona: CETISA, 1985-Available on: http://www.automaticaeinstrumentacion.com/.- Infoplc++ [on line]. Barcelona, 2018 [Consultation: 28/08/2018]. Available on: http://www.infoplc.net/plus-plus.- Buttu, Marco. El gran libro de Python [on line]. Barcelona: Marcombo, 2016 [Consultation: 02/07/2020]. Available on: https://github.com/marco-buttu/the-pythonic-way.

RESOURCES

Other resources:
Teaching material in Virtual Campus.
Teaching help support (Wonderware, Rockwell Automation, Mitsubishi i SMC),
On line Python libraries for development and visualization of data.