



## Course guides

# 820229 - SICIEIA - Information Systems and Industrial Communication

Last modified: 02/07/2020

**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:** 2020    **ECTS Credits:** 6.0    **Languages:** Catalan

### LECTURER

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**Coordinating lecturer:** PEDRO PONSA ASENSIO

**Others:** Primer quadrimestre:  
JAVIER FRANCISCO GÁMIZ CARO - T11, T12, T13, T14  
MARC LLUVA SERRA - T11, T12  
MANUEL LOZANO GARCÍA - T13, T14

Segon quadrimestre:  
MANUEL LOZANO GARCÍA - M21, M22, M25, M26  
PEDRO PONSA ASENSIO - M21, M22, M23, M24, M25, M26

### REQUIREMENTS

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CONTROL INDUSTRIAL I AUTOMATITZACIÓ - Precorequisit

### DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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**Specific:**

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

**Transversal:**

06 URI N2. EFFECTIVE USE OF INFORMATION 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 INFORMATION 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

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The course uses the teaching class, case study, examples, exercises and project based learning approach.



## LEARNING OBJECTIVES OF THE SUBJECT

1. Enter the student / the concepts of the various industrial communication techniques, terminology and the reference standards
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 |
|-------------------|-------|------------|
| Hours small group | 15,0  | 10.00      |
| Self study        | 90,0  | 60.00      |
| Hours large group | 45,0  | 30.00      |

**Total learning time:** 150 h

## CONTENTS

### (ENG) Tema 1: Information systems

#### Description:

- 1.1. Data, instrumentation and knowledge..
- 1.2. Data visualization with Python.
- 1.3. Time data analysis. Patterns.
- 1.4. Database and structured query language.
- 1.5. Connected enterprise and software development.

#### Specific objectives:

Students will be able to:  
identify current trends in technologies and the connected enterprise.

#### Related activities:

- Autonomous study
- Exercises
- Report

#### Related competencies :

CEEIA-28. Apply their knowledge to industrial informatics and communications.

CEEIA-29. Design automatic control systems.

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#### Full-or-part-time: 12h

Theory classes: 6h

Self study : 6h



## (ENG) Tema 2: Supervisory control systems

### Description:

- 2.1 Supervisory control. Monitoring, alarms and fault detection.
- 2.2 Architecture: Server/client, virtual server.
- 2.3 Cybersecurity and SCADA.
- 2.4. Design of SCADA applications.
- 2.5. OPC communications.

### Specific objectives:

Students will be able to:  
Apply a SCADA solution in automation systems.

### Related activities:

- Written exam
- Exercises
- Report
- Practice Laboratory

### Related competencies :

CEEIA-28. Apply their knowledge to industrial informatics and communications.  
CEEIA-29. Design automatic control systems.  
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### Full-or-part-time: 12h

Theory classes: 6h  
Self study : 6h

## (ENG) Tema 3: Communications Systems

### Description:

- 3.1. Introduction to Communication Systems.
- 3.2. Digital Communications.
- 3.3. Computers networks topology.
- 3.4. Reference models. OSI, TCP/IP.
- 3.5. OPC-UA and MQTT architecture and protocol.
- 3.6. 5G and Internet of things.

### Specific objectives:

Students will be able to:  
Classify and modelling of communications systems.

### Related activities:

- Autonomous study
- Exercises
- Practice Laboratory

### Related competencies :

CEEIA-28. Apply their knowledge to industrial informatics and communications.  
CEEIA-29. Design automatic control systems.  
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### Full-or-part-time: 12h

Theory classes: 6h  
Self study : 6h

#### (ENG) Tema 4: Industrial networks

**Description:**

- 4.1 Process networks functionalities.
- 4.2 Field bus. Device Net. Modbus.
- 4.3. Serial communications.
- 4.4. Ethernet/IP.
- 4.5. Programmable Logic Controllers networks.
- 4.6. Telematic networks.

**Specific objectives:**

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

**Related activities:**

- Examen
- Exercises
- Practice laboratory

**Related competencies :**

CEEIA-28. Apply their knowledge to industrial informatics and communications.  
CEEIA-29. Design automatic control systems.  
06 URI N2. EFFECTIVE USE OF INFORMATION 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:** 12h

Theory classes: 6h  
Self study : 6h

#### (ENG) Tema 5: Practices of Laboratory

**Description:**

- 5.1. Design and programming SCADA applications.
- 5.2. Communications DDE SCADA with Emulated PLC.
- 5.3. PLC network with Ethernet over an assembly academic system.
- 5.4. OPC SCADA-PLC communications.
- 5.5. SCADA communications with IoT Platforms.

**Specific objectives:**

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

**Related activities:**

- Exercises
- Searching for data sheets
- Laboratory practices

**Related competencies :**

CEEIA-28. Apply their knowledge to industrial informatics and communications.  
CEEIA-29. Design automatic control systems.  
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**Full-or-part-time:** 45h

Laboratory classes: 15h  
Self study : 30h



## ACTIVITIES

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### AD: Connected Industry

**Description:**

The skill in this subject is search of Information resources. Following examples and technical study cases, the students will be able to search information about the connected enterprise (industry 4.0).

**Specific objectives:**

Understand the new industrial paradigm.  
Industrial study case analysis.  
Writing a polite technical report.

**Material:**

Papers in technical journals. Automática e instrumentación. InfoPLC.

**Delivery:**

Month assessment and deadline (report) at the end of the semester.

**Related competencies :**

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**Full-or-part-time:** 57h

Theory classes: 21h

Self study: 36h

## GRADING SYSTEM

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First exam: 30%

Second exam: 25%

Practice Lab: 25%

Other controls AD: 20%

## EXAMINATION RULES.

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The evaluation method of this course meets the current academic regulations to be qualified: NO REVALUABLE.

## BIBLIOGRAPHY

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**Basic:**

- 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.
- Valdivia Miranda, Carlos. Comunicaciones industriales. Madrid: Paraninfo, 2019. ISBN 9788428338653.

**Complementary:**

- Infopl++ [on line]. Barcelona, 2018 [Consultation: 28/08/2018]. Available on: <http://www.infopl.net/plus-plus>.
- 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.automaticeinstrumentacion.com/>.
- Valdivia Miranda, Carlos. Redes telemáticas. Madrid: Paraninfo, 2015. ISBN 9788428334877.
- 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>. ISBN Automática e instrumentación. InfoPLC..



## RESOURCES

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### **Other resources:**

Teaching material in Virtual Campus.

Teaching help support (Wonderware, Rockwell Automation, SMC),

On line Python libraries for development and visualization of data.