Course guides
820229 - SICIEIA - Information Systems and Industrial Communication

Last modified: 04/06/2021

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: 2021 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

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

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, exercises and project based learning approach.

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] Tema1: Presentation

Description:
1.1. Presentation.
1.2. Information systems.
1.3. Communication systems.
1.4. Plan and schedule.

Specific objectives:
This is the presentation of the subject, defining all the systems inside it, and with the plan and schedule of the activities.

Full-or-part-time: 1h
Theory classes: 1h

(ENG) Tema 2: Communications Systems

Description:
2.1. Introduction to Communication Systems.
2.2. Digital Communications.
2.3. Computers networks topology.
2.4. Reference models. OSI, TCP/IP.
2.5. Communications protocols.
2.6. Flow diagram and protocol programming.

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

Related activities:
- Exam
- 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 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 3: Industrial networks

Description:
3.1 Communications networks in CIM and ISA95 architectures.
3.2. Local area networks. Wide area networks.
3.3 Field bus.
3.4. Serial communications. Serial port programming.
3.5. Ethernet/IP. Modbus TCP.
3.6. Wireless networks.
3.7. Network security techniques.

Specific objectives:
Studnets 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.
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Full-or-part-time: 24h
Theory classes: 12h
Self study : 12h

(ENG) Tema 4: Industrial Control and Supervisory control systems

Description:
4.1. P&ID representation.
4.2. Instrumentation and industrial control.
4.3. Supervisory control. Monitoring, alarms and fault detection.
4.4. Architecture: Server/client, virtual server.
4.5. Design and programming of SCADA applications.
4.6. Cibersecurity and SCADA.

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

Related activities:
- Written exam
- 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 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: 8h
Theory classes: 4h
Self study : 4h

(ENG) Tema 5: Information systems

Description:
5.1. Data, instrumentation and knowledge..
5.2. Data visualization with Python.
5.3. Time data analysis. Patterns.
5.4. Database and structured query language.
5.5. 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.
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: 16h
Theory classes: 8h
Self study : 8h

(ENG) Tema 6: Connected Industry

Description:
6.1. Connected industry.
6.2. Disruptive technologies.
6.3. Internet of things.
6.4. M2M communications.
6.5, MQTT protocol and comparison with OPC-UA.
6.6. 5G.

Specific objectives:
The basic objectis is learn the basic concepts about information and communication related to connected factory.

Related activities:
The associated activity is the AD.
Report.

Full-or-part-time: 7h
Theory classes: 7h

(ENG) Tema 7: Practices of Laboratory

Description:
7.1. Design and programming SCADA applications.
7.2. Communications DDE SCADA.
7.3. PLC network with Ethernet over an assembly academic system.
7.4. OPC SCADA-PLC communications.
7.5. 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

AD: Connected Industry

Description:
The skill in this subject is search of Information resourses. 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.
Writting 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 :
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: 18h
Guided activities: 1h
Self study: 17h

GRADING SYSTEM

First exam: 30%
Second exam: 25%
Practice Lab: 25%
Other controls AD: 20%

EXAMINATION RULES.

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

BIBLIOGRAPHY

Basic:
- 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.
- 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.
- Valdivia Miranda, Carlos. Redes telemáticas. Madrid: Paraninfo, 2015. ISBN 9788428334877.

Complementary:
- Infoplc++ [on line]. Barcelona, 2018 [Consultation: 28/08/2018]. Available on: http://www.infoplc.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.automaticaeinstrumentacion.com/.
- 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, SMC),
On line Python libraries for development and visualization of data.