Course guide
820229 - SICIEIA - Information Systems and Industrial Communication

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: 2023  ECTS Credits: 6.0  Languages: Catalan

LECTURER

Coordinating lecturer: PEDRO PONSA ASENSIO

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

Segon quadrimestre:
MANUEL LOZANO GARCÍA - Grup: M13, Grup: M14
PEDRO PONSA ASENSIO - Grup: M11, Grup: M12, Grup: M13, Grup: M14, Grup: M15, Grup: M16
FERNANDO GUILLERMO SANABRIA ORTEGA - Grup: M11, Grup: M12

REQUIREMENTS

CONTROL INDUSTRIAL I AUTOMATITZACIÓ - Precorequisite

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 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

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45,0</td>
<td>30.00</td>
</tr>
</tbody>
</table>

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: Communication Systems

Description:
2.1. Introduction to Communication Systems.
2.2. Digital Communications.
2.3. Networks topology.
2.4. Transmission modes.
2.5. Reference models. OSI, TCP/IP.
2.6. Communications protocols.
2.7. Socket.

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

Related activities:
- Exam
- Exercises
- Practice Laboratory

Related competencies:
CEEIA-29. Design automatic control systems.
CEEIA-28. Apply their knowledge to industrial informatics and communications.
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: 24h
Theory classes: 12h
Self study: 12h
(ENG) Tema 3: Industrial networks

Description:
3.1 Communications networks in CIM and ISA95 architectures.
3.2. Field bus.
3.3. Serial communications.
3.4. Ethernet/IP.
3.5. Modbus TCP.
3.6. Time sensitive networking. TSN.

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-29. Design automatic control systems.
CEEIA-28. Apply their knowledge to industrial informatics and communications.
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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. Instrumentation and PID industrial control.
4.2. Supervisory control. Monitoring, alarms and fault detection.
4.4. Design and programming of SCADA applications.
4.5. 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-29. Design automatic control systems.
CEEIA-28. Apply their knowledge to industrial informatics and communications.
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: 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.
5.7. Online exercises using Colab.

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 classroom with laptop
- Exam

Related competencies:
CEEIA-29. Design automatic control systems.
CEEIA-28. Apply their knowledge to industrial informatics and communications.

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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. Cloud communications.
6.6. 5G.

Specific objectives:
The basic object 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. SCADA definition. Design and script programming SCADA applications.
7.2. P&ID diagrams inside SCADA screen.
7.3. PLC network with Ethernet over an assembly academic system.
7.4. SCADA-PLC and OPC communications.
7.5. Security communications with OPC UA.
7.6. MQTT communications.

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-29. Design automatic control systems.
CEEIA-28. Apply their knowledge to industrial informatics and communications.
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Full-or-part-time: 45h
Laboratory classes: 15h
Self study: 30h
**ACTIVITIES**

**AD: Connected Industry -- Cibersecurity**

**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). In more detail, cibersecurity of automation systems, supervised by an SCADA system.

**Specific objectives:**
Understand the new industrial paradigm.
Industrial study case analysis about cibersecurity.
Enterprises and job opportunities.
Writing a polite technical report.

**Material:**
Papers in technical journals. Automática e instrumentación. InfoPLC or in INCIBE-CERT center.

**Delivery:**
Month assessment and deadline (report) at the last weeks of the semester.

**Related competencies:**
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:** 18h
Guided activities: 1h
Self study: 17h

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**GRADING SYSTEM**

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

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

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**BIBLIOGRAPHY**

**Basic:**

**Complementary:**
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.