220204 - Advanced Automation and Control of Industrial Processes

Coordinating unit: 205 - ESEIAAT - Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2019
Degree: MASTER’S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Teaching unit Compulsory)
ECTS credits: 2,5  Teaching languages: Catalan

Teaching staff
Coordinator: JOSEP CUGUERÓ ESCOFET
Others: ENRIQUE JAVIER AJENJO ESCOLANO
RAMON COMASOLIVAS FONT
JAUME FIGUERAS JOVE
FERNANDO GUILLERMO SANABRIA ORTEGA

Degree competences to which the subject contributes

Specific:
1. Ability to design and project control systems and advanced automated production processes.

Teaching methodology

The course methodology consists of:
- Class sessions.
- Laboratory sessions.
- Self study.

In the class sessions, professors will introduce the theoretical foundations of the subject, concepts, methods and illustrate them with examples and exercises to ease their understanding.

In laboratory sessions, professors guide students in applying theoretical concepts to solve experimental set-ups, based on critical thinking. Activities are proposed with the aim to promote the discussion and use the basic tools necessary to perform an automation system.
Students work on the material provided by the professors.

Learning objectives of the subject

Develop students' critical analysis and sufficient ability in automation technology selection and control strategies necessary to solve real problems in the field of advanced production and control of industrial processes.
# Study load

<table>
<thead>
<tr>
<th><strong>Total learning time:</strong> 62h 30m</th>
<th>Hours large group:</th>
<th>15h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group:</td>
<td>0h</td>
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<td>0.00%</td>
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<tr>
<td>Hours small group:</td>
<td>7h 30m</td>
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<td>12.00%</td>
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<tr>
<td>Self study:</td>
<td>40h</td>
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<td>64.00%</td>
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The final grade of the course is calculated in the following way:
- Practical activity, specification and programming of the control system: 50%
- Final written exam: 50%

According to school regulations, no additional assessment activities are needed.

**Content**

<table>
<thead>
<tr>
<th>Module 1: Introduction to PLC</th>
<th>Learning time: 21h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
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<tr>
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<td>Laboratory classes: 2h</td>
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<td>Self study : 15h</td>
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**Description:**
- PLC Introduction, CIM pyramid concept.
- PLCs classification.
- Data Format.
- Internal Structure of a PLC.
- Memory map of a PLC connectivity with sensors and actuators.
- Scan cycle concept.
- Structures of multi PLC CPU.
- PLCs Programming.

<table>
<thead>
<tr>
<th>Module 2: PLCs programming</th>
<th>Learning time: 20h 30m</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 7h</td>
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<tr>
<td></td>
<td>Laboratory classes: 3h 30m</td>
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<tr>
<td></td>
<td>Self study : 10h</td>
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**Description:**
- The PLC programming standard IEC 1131-3
- Programming Languages: IL, ST, LD, FBD
- Design and structure of a program: SFC SFC
- Examples on programming of PLCs

<table>
<thead>
<tr>
<th>Module 3: Industrial communications</th>
<th>Learning time: 21h</th>
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<tr>
<td></td>
<td>Theory classes: 4h</td>
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<tr>
<td></td>
<td>Laboratory classes: 2h</td>
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<tr>
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<td>Self study : 15h</td>
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**Description:**
- Introducció: Arquitectura CIM del sistema d'automatització i control industrial.
- Models de referència del sistema de comunicacions: models OSI i TCP/IP.
- Aspectes de nivell físic, enllaç, xarxa, transport i aplicació.

**Qualification system**
Bibliography

Basic:


Complementary: