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: 2018
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2013). (Teaching unit Compulsory)
ECTS credits: 2,5
Teaching languages: Catalan

Teaching staff

Coordinator: Comasolivas Font, Ramon
Others: Gugueró Escofet, Josep
Figueras Jové, Jaume
Pascual Alsina, Jan
Ajenjo Escolano, Enrique Javier

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>Total learning time: 62h 30m</th>
<th>Hours large group: 15h 24.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h 0.00%</td>
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<td>Hours small group: 7h 30m 12.00%</td>
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<td>Self study: 40h 64.00%</td>
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## 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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<td></td>
<td>Laboratory classes: 3h 30m</td>
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<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

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<tr>
<th>Module 3: Industrial communications</th>
<th>Learning time: 21h</th>
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<td></td>
<td>Theory classes: 4h</td>
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<td>Laboratory classes: 2h</td>
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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

The final grade consists of:
- Practice activity 1: 40%
- Practice activity 2: 20%
- Theoretical exam: 40%

Procedures are provided to improve unsatisfactory results obtained during the course.
Bibliography

Basic:


Complementary: