340240 - SIPI-K7P07 - Integrated Production Systems

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2015
Degree: BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: LUIS MIGUEL MUÑOZ MORGADO
Others: LUIS MIGUEL MUÑOZ MORGADO - ABEL TORRES CEBRIAN

Prior skills
Previous knowledge on programming, control theory and automation

Requirements
Q5: Automatització Industrial; Informàtica Industrial
Q6: Sistemes Robotitzats

Degree competences to which the subject contributes
Specific:
1. CE15. Basic knowledge of production and fabrication systems.
2. CE29. Ability to design automation control systems.

Teaching methodology
This subject is an example of learning by doing methodology. A relation between theoretic concepts and applied knowledge. We will use the project based learning and the model role playing approaches. The aim is use learnings tools in order to achieve the autonomy of the engineering students.

Learning objectives of the subject
1. General characteristics of the integrated production systems (form plant level to supervisory control level)
2. Skill acquisition in modelling and simulation systems
3. Identify essential elements on robotic production systems
4. Skill acquisition in developing robotic and computer vision applications over production systems
### 340240 - SIPI-K7P07 - Integrated Production Systems

#### Study load

<table>
<thead>
<tr>
<th></th>
<th>Hours large group</th>
<th>15h</th>
<th>10.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total learning time:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Hours medium group:</td>
<td></td>
<td>0h</td>
<td>0.00%</td>
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<tr>
<td>Hours small group:</td>
<td></td>
<td>30h</td>
<td>20.00%</td>
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<tr>
<td>Guided activities:</td>
<td></td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td>Self study:</td>
<td></td>
<td>105h</td>
<td>70.00%</td>
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</tbody>
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### Content

#### (ENG) Introduction to Computer Integrated Manufacturing

**Degree competences to which the content contributes:**

**Description:**
(ENG) Definitions
The flexible manufacturing
Components of a manufacturing system

**Specific objectives:**

#### (ENG) Modeling

**Degree competences to which the content contributes:**

**Description:**
(ENG) Modeling and simulation of production processes and logistics
Modeling with Petri Nets
Random effects model

**Related activities:**
(ENG) PR1 Modeling

**Specific objectives:**

#### (ENG) Simulation

**Degree competences to which the content contributes:**

**Description:**
(ENG) Introduction
Simulation of discrete event systems
Verification and validation of models
Analysis of results

**Related activities:**
(ENG) PR2 Simulation

**Specific objectives:**

#### (ENG) Computer Vision

**Degree competences to which the content contributes:**

**Description:**
(ENG) Introduction to Computer Vision
Acquisition and image processing
Segmentation and recognition
Industrial vision systems

**Specific objectives:**
**Related activities:**
(ENG) PR3 Vision

**Specific objectives:**

### (ENG) Robotics

<table>
<thead>
<tr>
<th>Degree competences to which the content contributes:</th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
<tr>
<td>(ENG) Application of robots in production lines</td>
</tr>
<tr>
<td>Special robots: robotic warehouses, parallel robots, mobile robots, machine tools.</td>
</tr>
</tbody>
</table>

**Related activities:**
(ENG) PR4 Robotics

**Specific objectives:**

### (ENG) PR1 Modeling

<table>
<thead>
<tr>
<th>Degree competences to which the content contributes:</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
<tr>
<td>(ENG) Introduction to simulation software ARENA</td>
</tr>
<tr>
<td>Representation of Petri Nets arena on environment</td>
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<tr>
<td>Petri Nets applied to case studies of production systems</td>
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<tr>
<td>Modeling machines</td>
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</tbody>
</table>

**Specific objectives:**

### (ENG) PR2 Simulation

<table>
<thead>
<tr>
<th>Degree competences to which the content contributes:</th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
<tr>
<td>(ENG) ARENA applied to case studies of production systems</td>
</tr>
<tr>
<td>Case studies. Comparison of alternatives</td>
</tr>
</tbody>
</table>

**Specific objectives:**

### (ENG) PR3 Vision

<table>
<thead>
<tr>
<th>Degree competences to which the content contributes:</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
<tr>
<td>(ENG) Introduction to the toolbox &quot;Image Processing&quot; toolbox of Matlab and National Instruments tools.</td>
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</table>

**Specific objectives:**
**Degree competences to which the content contributes:**

**Description:**
- Introduction to Programming in Rapid (ABB)
- Introduction to RobotStudio
- Introduction to the programming of CNC machines

**Specific objectives:**

**Qualification system**

The final qualification is:

\[ NF = 0.6 \times \text{Ex} + 0.2 \times \text{Practicum} + 0.2 \times \text{Team Group} \]

**Regulations for carrying out activities**

The evaluation is a set of proofs (individual and/or in group), in class or virtual approach:
- Ex individual proof about the theoretical parts of the subject (in class)
- Practicum: guided lessons in the laboratory
- Ex individual Practicum

**Bibliography**

**Basic:**

- Smith, Graham T. CNC machining technology. London [etc.]: Springer-Verlag, 1993. ISBN 0387198288 (V.1) ; 0387198296 (V.2) ; 038719830X (V.3).