340128 - SIRO-K6007 - Robotic Systems

Coordinating unit: 340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit: 707 - ESAII - Department of Automatic Control
Academic year: 2017
Degree: BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: Luis Miguel Muñoz
Others: Luis Miguel Muñoz

Prior skills
Skills in industrial automation, process control and programming.

Requirements
must previous passed
Q5 Industrial Automation; Industrial Informatics

Degree competences to which the subject contributes

Specific:
2. CE15. Basic knowledge of production and fabrication systems.
3. CE29. Ability to design automotion control systems.

Transversal:
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.
4. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.

Teaching methodology
Master classes, active learning and participative expositive classes, projects and problems based learning, and study of real cases.

Learning objectives of the subject
Identify and analyze the elements of a robot, their specifications and terminology.
Describe and analyze the models of a robot.
Describe the robot control techniques.
Know the robot programming techniques.
Know the criteria, methodology and standards about the implantation of robots, evaluating their integration capability in a social or industrial environment.
### Study load

<table>
<thead>
<tr>
<th><strong>Total learning time:</strong> 150h</th>
<th>Hours large group: 30h</th>
<th>20.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h</td>
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<td></td>
<td>Hours small group: 30h</td>
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<td>Guided activities: 0h</td>
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<td>Self study: 90h</td>
<td>60.00%</td>
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# Content

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<tr>
<th><strong>(ENG) 1 Background</strong></th>
<th><strong>Learning time: 6h</strong></th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Definition</td>
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</tr>
<tr>
<td>Classification</td>
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<tr>
<td>Brief history</td>
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<tr>
<td>Robots morphology</td>
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<td>Joints</td>
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<td>Industrial applications</td>
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<tr>
<td><strong>Related activities:</strong></td>
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<tr>
<td>PR1</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
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<tr>
<td>Locate the robot in the industrial domain and pay attention to collaborative tasks with humans. Know the different parts that the robot is composed.</td>
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<thead>
<tr>
<th><strong>(ENG) -2 Geometrics, Kinematics and dynamics</strong></th>
<th><strong>Learning time: 18h</strong></th>
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<tr>
<td><strong>Description:</strong></td>
<td>Theory classes: 18h</td>
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<tr>
<td>Position and orientation representation</td>
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<tr>
<td>Kinematic modelling</td>
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<td>Dynamic modelling</td>
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<td><strong>Related activities:</strong></td>
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<tr>
<td>PR2</td>
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<tr>
<td><strong>Specific objectives:</strong></td>
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<tr>
<td>Learn geometry, kinematics and dynamic aspects to understand the robot control movement of the next chapter</td>
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### (ENG) -3 Control and robots programming

**Description:**
- Control architectures
- Control based in dynamic model
- Adaptative control
- Effort control
- Path generation
- GEstual and Textrual programming

**Related activities:**
- PR1, PR2, PR3

**Specific objectives:**
Learn some aspects of dynamic control and programming in order to prepare robotic tasks

**Learning time:**
- 6h
  - Theory classes: 6h

### (ENG) -4 Mobile Robotics

**Description:**
- Introduction to mobile robotics

**Related activities:**
- PR4

**Specific objectives:**
Know the science of the wheeled mobile robots

**Learning time:**
- 4h
  - Theory classes: 4h

### (ENG) PR1 Industrial robots programming

**Description:**
- Introduction to programming robot system
- Programming tools
- Edition and programming
- Examples
- Porfolio

**Specific objectives:**
Learn the basic intructions for the programming of robotic tasks

**Learning time:**
- 4h
  - Theory classes: 4h
### (ENG) PR2 Robots: Modeling and simulation

**Description:**
Introduction to the robotics toolbox Matlab  
Study of the Spacial transformations  
Study of the kinematic model

**Specific objectives:**
Learn to use the mathematic tools in order to analyze the science behind robots

**Learning time:** 8h  
Theory classes: 8h

### (ENG) PR3 Programming robots tools

**Description:**
Introduction to programming and simulations robots  
Programming a robotized task  
Programming a robotized system

**Specific objectives:**
Know advanced tools for program and simulate industrial robots

**Learning time:** 2h  
Theory classes: 2h

### (ENG) PR4 Mobile robots

**Description:**
Programming wheeled mobile robots

**Specific objectives:**
Learn to solve mobile robot tasks using the acquired theoretical knowledge

**Learning time:** 2h  
Theory classes: 2h

### PR5 Miniproject

**Description:**
Conducting a group project

**Learning time:** 10h  
Theory classes: 10h
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**Qualification system**

Individual tests in the middle of the course (60%)
Team work (40%)

Presentations in group about a theme or project related to robotics
Laboratory Practicum and activities proposed during the course
Re-evaluation may be accessed in accordance with school regulations

**Bibliography**

**Basic:**


**Complementary:**

