Course guide  
340128 - SIRO-K6O07 - Robotic Systems

Unit in charge: Vilanova i la Geltrú School of Engineering  
Teaching unit: 707 - ESAII - Department of Automatic Control.

Degree:  
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Optional subject).  
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsory subject).  
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Optional subject).

Academic year: 2022  
ECTS Credits: 6.0  
Languages: Catalan, Spanish, English

LECTURER

Coordinating lecturer: 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 automation 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>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 large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

(ENG) 1 Background

Description:
Definition
Classification
Brief history
Robots morphology
Joints
Industrial applications

Specific objectives:
Locate the robot in the industrial domain and pay attention to collaborative tasks with humans. Know the different parts that the robot is composed.

Related activities:
PR1

Full-or-part-time: 6h
Theory classes: 6h

(ENG) -2 Geometrics, Kinematics and dynamics

Description:
Position and orientation representation
Kinematic modeling
Dynamic modeling

Specific objectives:
Learn geometry, kinematics, and dynamic aspects to understand the robot control movement of the next chapter

Related activities:
PR2

Full-or-part-time: 18h
Theory classes: 18h
(ENG) -3 Control and robots programming

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

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

Related activities:
PR1, PR2, PR3

Full-or-part-time: 6h
Theory classes: 6h

(ENG) -4 Mobile Robotics

Description:
Introduction to mobile robotics

Specific objectives:
Know the science of the wheeled mobile robots

Related activities:
PR4

Full-or-part-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

Full-or-part-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

**Full-or-part-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

**Full-or-part-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

**Full-or-part-time:** 2h  
Theory classes: 2h

### PR5 Miniproject

**Description:**
Conducting a group project

**Full-or-part-time:** 10h  
Theory classes: 10h

**GRADING 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 of the individual part  
Re-evaluation may be accessed in accordance with school regulations
BIBLIOGRAPHY

Basic:

Complementary: