Course guide
340128 - SIRO-K6007 - 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: 2023  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 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>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
</tbody>
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**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 amb pay attention to collaborative tasks with humans. Knpw the differents parts that the robot is composed.

**Related activities:**
PR1

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

(ENG) -2 Geometrics, Kinematics and dynamics

**Description:**
Positiona and orientation representation  
Kinematic modelling  
Dynamic modelling

**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:
Path generation
Gestual and Textrual programming
3D 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
Planning

Specific objectives:
Know the science of the wheeled mobile robots
Know the planning techniques

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 instructions 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

In general:
Individual tests in the middle and final of the course (60%)
Team work (40%)

Optionally:
Presentations in group about a theme or project related to robotics

Others:
Re-evaluation may be accessed in accordance with school regulations
**BIBLIOGRAPHY**

**Basic:**

**Complementary:**