

# Course guide 340128 - SIRO-K6007 - Robotic Systems

Vilenaue i le Calturi Calcal of Engineering

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Academic year: 2024	ECTS Credits: 6.0 Languages: Catalan, Spanish, English
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).
Teaching unit:	707 - ESAII - Department of Automatic Control.

LECTURER	
Coordinating lecturer:	Luis Miguel Muñoz
Others:	Luis Miguel Muñoz

## **PRIOR SKILLS**

Units in all and a

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**

Туре	Hours	Percentage
Hours large group	30,0	20.00
Self study	90,0	60.00
Hours small group	30,0	20.00

Total learning time: 150 h

# CONTENTS

# (ENG) 1 Background Description:

Definition Classification Briev 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 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**

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:

The re-evaluation of the subject can be done by all students who have a total rating between 2 and 4.9 and the final mark will be a maximum of 7 for the students who have to do it. The part corresponding to the theory exams will be reassessed.

# **BIBLIOGRAPHY**

#### **Basic:**

 - Reyes Cortés, Fernado. Robótica : control de robots manipuladores [on line]. Barcelona : México: Marcombo : Alfaomega, 2011
 [ Consultation: 16/11/2022]. Available on: https://search.ebscohost.com/login.aspx?direct=true&AuthType=ip,uid&db=nlebk&AN=2749643&site=ehost-live&ebv=EB&ppid=pp
 C. ISBN 9788426717450.

- Corke, Peter I. Robotics, vision and control : fundamental algorithms in MATLAB® [on line]. 2nd ed. Cham, Switzerland: Springer, 2017 [Consultation: 22/04/2022]. Available on: <u>https://link.springer.com/book/10.1007/978-3-319-54413-7</u>. ISBN 9783319544120.

#### **Complementary:**

- Libro blanco de la robótica : de la investigación al desarrollo tecnológico y futuras aplicaciones. Madrid: Comité Español de Automática : Ministerio de Educación y Ciencia, 2007. ISBN 9788469038840.

- Gómez de Gabriel, Jesús Manuel; Ollero Baturone, Aníbal; García Cerezo, Alfonso José. Teleoperación y telerrobótica. Madrid [etc.]: Pearson Education, 2006. ISBN 9788483222966.

- Craig, John J. Robótica [on line]. 3a ed. México [etc.]: Pearson Educacion, 2006 [Consultation: 16/02/2024]. Available on: <a href="https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB\_BooksVis?cod">https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB\_BooksVis?cod</a> primaria=1000187&codigo libro=3184. ISBN 9702607728.