![UPC logo] **UNIVERSITAT POLITÈCNICA DE CATALUNYA BARCELONATECH**

Course guide
240637 - 240637 - Robotics in Engineering

Last modified: 16/05/2023

Unit in charge:	Barcelona School of Industrial Engineering
Teaching unit:	707 - ESAII - Department of Automatic Control.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Optional subject).

Academic year: 2023   **ECTS Credits:** 4.5   **Languages:** Catalan

LECTURER

Coordinating lecturer: Yolanda Bolea Monte

Others: Yolanda Bolea Monte
Antoni Grau Saldes

PRIOR SKILLS

Any specific

REQUIREMENTS

GETI specific requirements

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
4. Spatial vision capacity and knowledge on graphic representation techniques, both with traditional methods of metrical geometry and descriptive geometry, and by means of computer aided design applications.
3. Basic knowledge on the use and programming of computers, operative systems, data bases and computer software with an engineering application.
2. Knowledge on automatic regulation and control techniques and their application in industrial automation.
1. Capacity to solve mathematical problems that can appear in engineering . Aptitude to apply knowledge about: linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and derived partial equations; numerical methods; numerical algorithm; statistics and optimisation.

Transversal:
6. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.
7. EFFECTIVE USE OF INFORMATION RESOURCES. Managing the acquisition, structure, analysis and display of information from the own field of specialization. Taking a critical stance with regard to the results obtained.
5. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.
8. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

TEACHING METHODOLOGY

This subject is based on practical aspects, basically the programming of real robots (UR3) in industrial applications. Therefore, the teaching methodology of this subject will be based on problems. Most sessions will be held in the robotics laboratory after having received sufficient basic theoretical knowledge.

LEARNING OBJECTIVES OF THE SUBJECT

Students attending this course must be able to:
a) Describe the types of robots and the current applications of robotics
b) Explain de needs and alternatives in planning and programming of robotic systems
c) Describe the sensors used in robotics and the robotic manipulation issues.
d) To adquire skills in programming real robots

STUDY LOAD

Type	Hours	Percentage
Self study	67,5	60.00
Hours medium group	45,0	40.00

Total learning time: 112.5 h

CONTENTS

1. Robotics Introduction

Description:
- Manipulators
- Mobile robots (wheeled robots / freeflying robots)
- Mobile manipulators
- Legged robots / mechanical hands / humanoids / exoskeleton for human performance augmentation
- Biologically inspired robots / micro-robots and nano-robots
- Multiple robotic systems / networked robots

Full-or-part-time: 3h
Theory classes: 3h

2. Robots fundamentals and applicatoion fields

Description:
- Industrial robotics
- Underwater robotics / Aerial robotics / Space robotics
- Robotics in agriculture and forestry / Robotics in construction / Mining Robotics
- Robotics in hazardous environments / Search and rescue robotics
- Kynematics
- Computer Vision

Full-or-part-time: 9h
Theory classes: 9h

3. Robots programming

Description:
- Different programming sources
- Programming languages â□□â□□in robotics

Full-or-part-time: 3h
Theory classes: 3h

4. Social and ethical implications of robotics

Description:
- Ethical issues in science and technology
- Roboethics taxonomy

Full-or-part-time: 3h
Theory classes: 3h

GRADING SYSTEM

There is no exam.
Final score = 0.5*monographic report + 0.5*team lab practices

EXAMINATION RULES.

Any specific

BIBLIOGRAPHY

Basic:
- Corke, Peter I. Robotics, vision and control : fundamental algorithms in Matlab [on line]. 1st ed. New York: Springer, 2011 [Consultation: 05/04/2017]. Available on: http://dx.doi.org/10.1007/978-3-642-20144-8. ISBN 9783642201431.
- Siciliano, B.; Khatib, O. (eds.). Springer handbook of robotics [on line]. 2on ed. Cham: Springer Handbooks, 2016 [Consultation: 29/03/2023]. Available on: https://link-springer-com.recursos.biblioteca.upc.edu/book/10.1007/978-3-319-32552-1. ISBN 3319325523.