

Academic Year: (2023 / 2024)

Review date: 26-04-2023

Department assigned to the subject: Systems Engineering and Automation Department

Coordinating teacher: OÑA SIMBAÑA, EDWIN DANIEL

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Industrial Robotics
Robot Operating Systems
Computer image processing

OBJECTIVES

The goal of the course is the acquisition of new advanced concepts about industrial robotics. The course is related to the industrial robot from an integrated point of view, that is, the robot is not an isolated machine but it is a main part of the productive process. In this way, advanced programming and control methods are studied to design advanced industrial applications.

The student will acquire the necessary knowledge for designing and programming advanced applications with industrial robots, collaborative robots, and perception systems. As well, the student will learn to use the necessary resources for robotic systems integration within a flexible production cell.

Each part of the theoretical content of the course is complemented with practical sessions to apply the methods and concepts exposed. It will be performed by the use of robotic simulators and real robots in laboratory.

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction.
 - 1.1. The industrial robot and the flexible production cell
 - 1.2. Advanced applications
2. Advanced programming of industrial robots
 - 2.1. Advanced programming of movements
 - 2.2. Programming of advanced functions
3. Task control for advanced applications
 - 3.1. Advanced methods for task control
 - 3.2. Visual control
 - 3.3. Force control
4. Advanced concepts of safety
 - 4.1 Safe Human-Robot Interaction
 - 4.2 Normative, definitions, and applications
 - 4.3 Risk assessment
5. Practical applications of advanced control methods
 - 5.1 Design and simulation of advanced applications
 - 5.2 Development of human-machine interfaces
6. Integration of systems for advanced applications

- 6.1. Object recognition
- 6.2. Communication technologies
- 6.3. Task synchronization

- 7. Commissioning of advanced industrial applications

- 8. Cooperative robots
 - 8.1. The cooperative robot
 - 8.2. Devices for cooperative robots
 - 8.3. Study and specification of applications

LEARNING ACTIVITIES AND METHODOLOGY

- Lecture sessions oriented to the acquisition of theoretical knowledge of advanced industrial robotics. Groupal or individual tutorial sessions oriented to specific concepts clarification

- Personal student homework to set up practical sessions, to carry out practical exercises and problem solution

- Practical sessions to apply theoretical acquired knowledge through the design and programming of robotic applications in simulated and real environments

ASSESSMENT SYSTEM

% end-of-term-examination:	0
% of continuous assessment (assignments, laboratory, practicals...):	100

The assessment system of this course follows the continuous evaluation model, where attendance and the solution to the proposed exercises will be considered.

BASIC BIBLIOGRAPHY

- Ganesh S. Hegde A TEXTBOOK ON INDUSTRIAL ROBOTICS , Laxmi Publications, 2007

- Mike Wilson IMPLEMENTATION OF ROBOT SYSTEMS: AN INTRODUCTION TO ROBOTICS, AUTOMATION, AND SUCCESSFUL SYSTEMS INTEGRATION IN MANUFACTURING, Butterworth-Heinemann, 2014

- Peter Corke Robotics, Vision and Control, Springer, 2017

- Tadej Bajd INTRODUCTION TO ROBOTICS, Springer Science & Business Media, 2013