SUBJECT TEACHING GUIDE

G1013 - Industrial Robotics and Computer Vision

Degree in Industrial Electronic Engineering and Automatic Control Systems
First Degree in Industrial Electronic Engineering and Automatic Control Systems

Academic year 2024-2025

1. IDENTIFYING DATA				
Degree	Degree in Industrial Electronic Engineering and Automatic Control Systems First Degree in Industrial Electronic Engineering and Automatic Control Systems		Type and Year	Optional. Year 4 Optional. Year 4
Faculty	School of Industrial Engineering and Telecommunications			
Discipline	Subject Area: Systems and Automation Engineering Optional Module			
Course unit title and code	G1013 - Industrial Robotics and Computer Vision			
Number of ECTS credits allocated	6	Term	Semester based (2)	
Web				
Language of instruction	English		Mode of delivery	Face-to-face

Department	DPTO. TECNOLOGIA ELECTRONICA E INGENIERIA DE SISTEMAS Y AUTOMATICA
Name of lecturer	CARLOS TORRE FERRERO
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Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO CARLOS TORRE FERRERO (S2018)
Other lecturers	

3.1 LEARNING OUTCOMES

- Good knowledge of the following issues:
  The different setups of industrial robots.
  Kinematic and dynamic control of industrial robots.
  The different components of a computer vision system.
  2D computer vision techniques and basic image processing.
  Visual control techniques of industrial robots.

4. OBJECTIVES

Deep Understanding of Kinematics, Dynamics and Control of Industrial Robots .
Exposition and detailed knowledge of 2D Vision Techniques.
Integration of Robotics and 2D Computer Vision for automatically performing different tasks by means of Industrial Robots .

6. SUBJECT PROGRAM

CONTENTS	
1	Introduction to Computer Vision. Image Acquisition, illumination, components. Camera Calibration.
2	Basic Image Processing. Edge Detection. Morphological Transformations.
3	Segmentation. Feature Extraction. Object Recognition.
4	Introduction to Robot Control.
5	Direct Kinematics. Inverse Kinematics. Kinematic Trajectory Planning.
6	Dynamic Modeling of Industrial Robots.
7	Dynamic Control of a Robot Manipulator. Introduction to Robot Programming

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Kinematic Control of Industrial Robots	Work	No	Yes	30,00
Development of Computer Vision Applications for the resolution of tasks	Work	No	Yes	30,00
Exam about the lab practices and contents of Computer Vision	Others	No	Yes	20,00
Exam about the lab practices and contents of Industrial Robotics	Others	No	Yes	20,00
TOTAL				100,00

Observations

All the activities of this subject will be done in English.
The students will receive a penalty for the tasks that are not handed in before the deadline.

NOTE: In case the competent health and educational authorities propose a distance assessment scenario, the affected tests will be carried out using virtual support under the conditions established by the University of Cantabria

Observations for part-time students

Part-time students will have to inform the professor at the beginning of the course if they will be able to follow the continuous assessment activities.

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
Computer vision: principles, algorithms, applications, learning. Davies, E. R. Science Direct, 2018, 5th ed.
Robotics, vision and control: fundamental algorithms in MATLAB. Corke, Peter. Springer, 2017.
Introduction to robotics / S.K. Saha. McGraw Hill Education, 2015. 2nd ed.
Introduction to robotics: mechanics and control. Craig, J. J, Pearson Education, 2005, 3rd ed.