SUBJECT TEACHING GUIDE

1111 - Industrial Robotics and Three-dimensional Vision

Master's Degree in Industrial Engineering
Master's Degree in Industrial Engineering Research

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Master's Degree in Industrial Engineering Master's Degree in Industrial Engineering Research			Type and Year	Optional. Year 2 Optional. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Electroenergetic Module Electromechanic / Mechatronics Module Advanced Techniques in Automation				
Course unit title and code	1111 - Industrial Robotics and Three-dimensional Vision				
Number of ECTS credits allocated	5	Term		Semester based (2)	
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. TECNOLOGIA ELECTRONICA E INGENIERIA DE SISTEMAS Y AUTOMATICA
Name of lecturer	JOSE RAMON LLATA GARCIA
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Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO JOSE RAMON LLATA GARCIA (S2017)
Other lecturers	CARLOS TORRE FERRERO

3.1 LEARNING OUTCOMES

- Understanding kinematic and dynamic control for industrial robots.
- Master 2D-dimensional and 3D-dimensional image processing techniques.
- Skills in the three-dimensional visualization of the workspace.
- Introduction to visual Control of Industrial Robots

4. OBJECTIVES
Deep understanding of Kinematics, Dynamics and Programming of Industrial Robots.
To show and to obtain and deep understanding on computer vision techniques in two and three dimensions.
User level understanding of basic techniques of Artificial Intelligence
Integration of robotics, artificial intelligence and Guided Dimensional Vision for Industrial Robots.

6. SUBJECT PROGRAM	
CONTENTS	
1	2D VISION: Introduction to Artificial Vision. Imaging, lighting components
2	2D VISION Basic Image Processing. Edge Detection. Morphological transformations.
3	2D VISION: image segmentation. Feature extraction. Object recognition
4	3D VISION: Camara Model. Camera Calibration
5	3D VISION: Vision Stereoscopic: Canonical and general settings. Passive methods.
6	3D VISION: Active triangulation methods: point, line, multiple lines. Screening of binary patterns. 3D reconstruction based intensity ratio. TOF cameras
7	ROBOTICS: Introduction
8	Robotics: Kinematics
9	ROBOTICS: Dynamics
10	ROBOTICS: Dynamic Control
11	Robotics: Visual and Intelligent Control, and Programming

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Continuous Assessment	Work	Yes	Yes	30,00
Continuous assessment based on practical exercises	Laboratory evaluation	Yes	Yes	20,00
Continuous assessment. based on practical exercises	Work	Yes	Yes	30,00
Continuous Assessment. Practices Robotica	Laboratory evaluation	Yes	Yes	20,00
TOTAL				100,00

Observations
Remote evaluation, of these same works and tests, is planned in the case of a new health alert by COVID-19 making it impossible to conduct the evaluation in person.

Observations for part-time students
They will take theoretical and practical exams. Remote evaluation, of these same examns, is planned in the case of a new health alert by COVID-19 making it impossible to conduct the evaluation in person.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Kelly, R., Santibañez, V. Control de Movimiento de Robots Manipuladores. Prentice Hall 2003.
Torres F., Pomares J. Gil, P.m Puente S. Aracil R. "Robots y Sistemas Sensoriales", Pearson education, 2002
Craig, J. Introduction to Robotics: Mechanics and Control. Pearson, 2013
Barrientos. L.F. Penín, C. Balaguer. R. Aracil. "Fundamentos de Robótica". Mc Graw Hill, 2007
Hartley,R. Zisserman, A. Multiple View Geometry in Computer Vision, Cambridge, 2004
De la Escalera, A. Visión por Computador. Fundamentos y Métodos. Pearson Education, 2001
Forsyth, David A., Ponce, J. Computer vision : a modern approach. Pearson, 2004