UNIVERSIDAD DE CASTILLA - LA MANCHA
GUÍA DOCENTE

1. General information

Course: INDUSTRIAL ROBOTS
Type: CORE COURSE
Degree: 359 - UNDERGRAD. IN INDUSTRIAL ELECTRONICS AND AUTOMAT. ENGINEERING (CR)
Center: 602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL
Year: 3
Main language: Spanish
Use of additional languages:
Web site:

Code: 56506
ECTS credits: 6
Academic year: 2022-23
Group(s): 20
Duration: C2
Second language: English
English Friendly: Y
Bilingual: N

Lecturer: **ANDRES SALOMON VAZQUEZ FERNANDEZ PACHECO** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
Edificio Politécnico 2-B02	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES	Vía Teams	andress.vazquez@uclm.es	

2. Pre-Requisites

Not established

3. Justification in the curriculum, relation to other subjects and to the profession

Not established

4. Degree competences achieved in this course

Course competences

Code	Description
A05	To have developed the learning skills necessary to undertake subsequent studies with a greater degree of autonomy.
A12	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
A13	Ability to take the initiative to solve problems, take decisions, creativity, critical reasoning and ability to communicate and transmit knowledge, skills and abilities in Industrial Electronic Engineering and Automation.
D09	Knowledge of principles and applications of robotic systems.

5. Objectives or Learning Outcomes

Course learning outcomes

Description
Application of the main robot information tools
Know the applications of industrial robots
Ability to dynamically model the structure of a rigid robot
Know the work space of a robot and its limitations
Ability to generate trajectories within the work environment
Ability to identify different classes of robots
Use the principle programming languages of industrial robots

6. Units / Contents

Unit 1: Presentation
    Unit 1.1
    Unit 1.2
Unit 2: Introduction
    Unit 2.1
    Unit 2.2
    Unit 2.3
    Unit 2.4
Unit 3: Robot Morphology
    Unit 3.1
    Unit 3.2
    Unit 3.3
    Unit 3.4
    Unit 3.5
    Unit 3.6
Unit 4: Mathematical Tools
    Unit 4.1
    Unit 4.2

Unit 4.3
Unit 4.4
Unit 4.5
Unit 4.6
Unit 5: Robot Kinematics
Unit 5.1
Unit 5.2
Unit 5.3
Unit 6: Differential Kinematics
Unit 6.1
Unit 6.2
Unit 6.3
Unit 6.4
Unit 6.5
Unit 6.6
Unit 7: Static Forces in Manipulators
Unit 7.1
Unit 7.2
Unit 7.3
Unit 7.4
Unit 8: Trajectory Planning
Unit 8.1
Unit 8.2
Unit 8.3
Unit 8.4
Unit 8.5
Unit 8.6
Unit 8.7
Unit 9: Robot Programming
Unit 9.1
Unit 9.2
Unit 9.3
Unit 9.4
Unit 9.5
Unit 9.6
Unit 9.7
Unit 9.8
Unit 10: Industrial applications of manipulators
Unit 10.1
Unit 10.2
Unit 11: New Trends in robotics
Unit 11.1
Unit 11.2
Unit 11.3
Unit 11.4
Unit 11.5
Unit 11.6
Unit 11.7

7. Activities, Units/Modules and Methodology							
Training Activity	**Methodology**	**Related Competences (only degrees before RD 822/2021)**	**ECTS**	**Hours**	**As**	**Com**	**Description**
Class Attendance (theory) [ON-SITE]	Lectures	A05 A12 A13 D09	0.8	20	N	-	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	A05 A12 A13 D09	0.72	18	N	-	
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	A05 A12 A13 D09	0.6	15	Y	Y	
Writing of reports or projects [OFF-SITE]	Group Work	A05 A12 A13 D09	1.68	42	Y	Y	
Practicum and practical activities report writing or preparation [OFF-SITE]	Guided or supervised work	A05 A12 A13 D09	0.6	15	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	A05 A12 A13 D09	1.24	31	N	-	
Final test [ON-SITE]	Assessment tests	A05 A12 A13 D09	0.08	2	Y	Y	
Project or Topic Presentations [ON-SITE]	Group Work	A05 A12 A13 D09	0.08	2	Y	Y	
Individual tutoring sessions [ON-SITE]	Other Methodologies	A05 A12 A13 D09	0.12	3	N	-	
On-line debates and forums [OFF-	Other Methodologies	A05 A12 A13 D09	0.08	2	N	-	

SITE]

| | | Total: | 6 | 150 | |

| Total credits of in-class work: 2.4 | Total class time hours: 60 |
| Total credits of out of class work: 3.6 | Total hours of out of class work: 90 |

As: Assessable training activity
Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Projects	35.00%	35.00%	
Final test	40.00%	40.00%	
Assessment of activities done in the computer labs	25.00%	25.00%	
Total:	100.00%	100.00%	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences).

9. Assignments, course calendar and important dates

Not related to the syllabus/contents	
Hours	**hours**

Unit 1 (de 11): Presentation

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	.5

Unit 2 (de 11): Introduction

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	.25

Unit 3 (de 11): Robot Morphology

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Writing of reports or projects [AUTÓNOMA][Group Work]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	4
Final test [PRESENCIAL][Assessment tests]	.25
Project or Topic Presentations [PRESENCIAL][Group Work]	.25
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	.5
On-line debates and forums [AUTÓNOMA][Other Methodologies]	.25

Unit 4 (de 11): Mathematical Tools

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Writing of reports or projects [AUTÓNOMA][Group Work]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	4
Final test [PRESENCIAL][Assessment tests]	.25
Project or Topic Presentations [PRESENCIAL][Group Work]	.25
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	.25
On-line debates and forums [AUTÓNOMA][Other Methodologies]	.25

Unit 5 (de 11): Robot Kinematics

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	5
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	6
Writing of reports or projects [AUTÓNOMA][Group Work]	5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Guided or supervised work]	6
Study and Exam Preparation [AUTÓNOMA][Self-study]	5
Final test [PRESENCIAL][Assessment tests]	.25
Project or Topic Presentations [PRESENCIAL][Group Work]	.25
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	.25
On-line debates and forums [AUTÓNOMA][Other Methodologies]	.25

Unit 6 (de 11): Differential Kinematics

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	4
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	3
Writing of reports or projects [AUTÓNOMA][Group Work]	5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Guided or supervised work]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	4

Final test [PRESENCIAL][Assessment tests]	.25
Project or Topic Presentations [PRESENCIAL][Group Work]	.25
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	.5
On-line debates and forums [AUTÓNOMA][Other Methodologies]	.25

Unit 7 (de 11): Static Forces in Manipulators

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Writing of reports or projects [AUTÓNOMA][Group Work]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	3
Final test [PRESENCIAL][Assessment tests]	.25
Project or Topic Presentations [PRESENCIAL][Group Work]	.25
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	.25
On-line debates and forums [AUTÓNOMA][Other Methodologies]	.25

Unit 8 (de 11): Trajectory Planning

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	2
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	3
Writing of reports or projects [AUTÓNOMA][Group Work]	5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Guided or supervised work]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	4
Final test [PRESENCIAL][Assessment tests]	.25
Project or Topic Presentations [PRESENCIAL][Group Work]	.25
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	.25
On-line debates and forums [AUTÓNOMA][Other Methodologies]	.25

Unit 9 (de 11): Robot Programming

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1.5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	3
Writing of reports or projects [AUTÓNOMA][Group Work]	5
Practicum and practical activities report writing or preparation [AUTÓNOMA][Guided or supervised work]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	2
Final test [PRESENCIAL][Assessment tests]	.25
Project or Topic Presentations [PRESENCIAL][Group Work]	.25
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	.25
On-line debates and forums [AUTÓNOMA][Other Methodologies]	.25

Unit 10 (de 11): Industrial applications of manipulators

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Writing of reports or projects [AUTÓNOMA][Group Work]	5
Study and Exam Preparation [AUTÓNOMA][Self-study]	1
Final test [PRESENCIAL][Assessment tests]	.25
Project or Topic Presentations [PRESENCIAL][Group Work]	.25
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	.25
On-line debates and forums [AUTÓNOMA][Other Methodologies]	.25

Unit 11 (de 11): New Trends in robotics

Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	1
Writing of reports or projects [AUTÓNOMA][Group Work]	2
Study and Exam Preparation [AUTÓNOMA][Self-study]	1
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	.25

Global activity

Activities	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	20
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	18
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	15
Writing of reports or projects [AUTÓNOMA][Group Work]	42
Practicum and practical activities report writing or preparation [AUTÓNOMA][Guided or supervised work]	15
Study and Exam Preparation [AUTÓNOMA][Self-study]	31
Final test [PRESENCIAL][Assessment tests]	2
Project or Topic Presentations [PRESENCIAL][Group Work]	2
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	3
On-line debates and forums [AUTÓNOMA][Other Methodologies]	2

Total horas: 150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description

ABB	Manual de RobotStudio http://www.abb.es/product/seitp327/df90f6fe2c1ffc64c125725100252d4d.aspx?productLanguage=es&country=ES		2013
Bruno Siciliano	HandBook of Robotics	Springer	2008
J.J. Craig.	Introduction to Robotics	Addison-Wesley	1998
Peter Corke	ROBOTIC TOOLBOX http://petercorke.com/Robotics_Toolbox.html		2008
Richard M. Murray	A Mathematical Introduction to Robotic Manipulation http://www.cds.caltech.edu/~murray/mlswiki	CRC	
The MathWorks	MATLAB Reference Guide		1993
A. Barrientos, L.F. Peñín, C. Balaguer y R. Aracil.	Fundamentos de Robótica	Mc Graw-Hill	2007