UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2022/23
Subject (*)	Industrial Robotics		Code	770G01041
Study programme	Grao en Enxeñaría Electrónica Industrial e Automática			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Third	Optional	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Industrial			
Coordinador	Casteleiro Roca, José Luis	E-mail	jose.luis.casteleiro@udc.es	
Lecturers	Casteleiro Roca, José Luis Meizoso López, Maria del Carmen	E-mail	jose.luis.casteleiro@udc.es carmen.meizoso@udc.es	
Web	https://moodle.udc.es/			
General description	Esta materia está dedicada ao estudo dos robots como elementos da automatización da produción. Os robots son máquinas que integran compoñentes mecánicos, eléctricos, electrónicos e dispositivos sensoriais e de comunicacións, baixo a supervisión dun sistema informático de control en tempo real.			

Study programme competences	
Code	Study programme competences
A9	Capacidade de visión espacial e coñecemento das técnicas de representación gráfica, tanto por métodos tradicionais de xeometría métrica e xeometría descritiva como mediante as aplicacións de deseño asistido por ordenador.
A26	Coñecer os fundamentos e aplicacións da electrónica dixital e microprocesadores.
A28	Coñecemento aplicado de instrumentación electrónica.
A31	Coñecementos de regulación automática e técnicas de control e a súa aplicación á automatización industrial.
A32	Coñecer os principios e aplicacións dos sistemas robotizados.
A33	Coñecemento aplicado de informática industrial e comunicacións.
A34	Capacidade para deseñar sistemas de control e automatización industrial.
B1	Capacidade de resolver problemas con iniciativa, toma de decisións, creatividade e razoamento crítico.
B4	Capacidade de traballar e aprender de forma autónoma e con iniciativa.
B5	Capacidade para empregar as técnicas, habilidades e ferramentas da enxeñaría necesarias para a práctica desta.
B6	Capacidade de usar adecuadamente os recursos de información e aplicar as tecnoloxías da información e as comunicacións na enxeñaría.
C3	Desenvolverse para o exercicio dunha cidadanía aberta, culta, crítica, comprometida, democrática e solidaria, capaz de analizar a realidade, diagnosticar problemas, formular e implantar solucións baseadas no coñecemento e orientadas ao ben común.

Learning outcomes			
Learning outcomes	Study programme competences		
Know what an industrial robot is and identify its main applications	A26 A28 A32	B5 B6	
Know the problem of modeling and kinematic control in robots	A9 A31 A33 A34	B5	

Know the problem of modeling and dynamic control in robots	A26 A28 A32 A34	B1 B4 B6	
Know the robot programming methods	A26 A32 A34	B1 B5 B6	
Know the criteria for implementing an industrial robot	A33 A34	B6	C3

Contents	
Topic	**Sub-topic**
Morphology: mechanical structures, sensory and actuation subsystems, tools and fixtures.	Morphology: Mechanical structure, transmissions and reducers, actuators, sensors, control system and final effector.
Direct and inverse geometric and kinematic model.	Direct kinematic problem. Denavit - Hartember method. Inverse kinematic problem. Methods. Jacobian concept.
Kinematic control and trajectory generation.	Kinematic control functions. Types of trajectories. Generation of trajectories. Interpolation.
Modeling and dynamic control. Servo control strategies.	Monoarticular control. Multi-joint control. adaptive check.
Control of force and accommodation. Integration with external sensors.	Types of external sensors in industrial robotics.
Robot programming.	Robot programming methods. ABB's RAPID language. Simulation and programming with RobotStudio.
Selection and implementation of industrial robots. Safety of robotic installations.	Design and control of a robotic cell. Criteria for selecting a robot and economic justification. Safety in robotic installations.

Planning				
Methodologies / tests	**Competencies**	**Ordinary class hours**	**Student?s personal work hours**	**Total hours**
Guest lecture / keynote speech	A26 A32 A33 A34 B1 B4 B5 B6 C3	17	23	40
Problem solving	A9 A28 A31 A32 A33 A34 B1 B4	10	30	40
Laboratory practice	A26 A28 A31 A32 A33 B1 B4 B5 B6	15	35	50
Objective test	A31 A32 B1 B4	3	14	17
Personalized attention		3	0	3
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	**Description**

Guest lecture / keynote speech	Keynote speech complemented with the use of audiovisual media and the introduction of some questions to students, in order to transmit knowledge and facilitate learning. The order of the topics covered will not have to be the one described in the teaching guide. In addition, there will be topics that can be seen together on the development of others, and the division between them may not be strict.
Problem solving	Solving exercises and specific problems in the classroom, from the knowledge explained.
Laboratory practice	Performing laboratory practice as far as possible; or, failing that, solving exercises and specific problems in the classroom, from the knowledge explained.
Objective test	It consists in carrying out an objective test of approximately 2 hours, in which the acquired knowledge will be evaluated.

Personalized attention	
Methodologies	**Description**
Laboratory practice Problem solving	The student has the relevant meetings of personalized tutorials, to resolve the concerns arising from the matter.

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Laboratory practice	A26 A28 A31 A32 A33 B1 B4 B5 B6	Some tasks established in the subject, within the framework of this methodology	30
Problem solving	A9 A28 A31 A32 A33 A34 B1 B4	Realization of works, exercises and problems	20
Objective test	A31 A32 B1 B4	Exam type objective test	50

Assessment comments
As part of the "Laboratory practice" may include aspects such as attendance, attitude, etc., to help obtain the approved. In addition, it may also include in this methodology the assessment of the presentation in class of personal work. The "Mixed Test" can be divided into a multiple choice part and a few questions. It will be necessary to exceed 35% of the score in the multiple choice of the "Mixed Test" to pass. For the second opportunity, there will be no second deadline for assignments, and the evaluation of "Laboratory practice" will be included in "Mixed test". The evaluation criteria of the early December call will be the same as those of the second opportunity of the previous year. Students with recognition of part-time dedication and academic waiver of attendance exemption, second establishes the "NORMA QUE REGULA O RÉXIME DE DEDICACIÓN AO ESTUDO DOS ESTUDANTES DE GRAO NA UDC (Arts. 2.3; 3.b e 4.5) (29/5/212)", will be evaluated in the same way, allowing one more week of margin in the assignments.

Sources of information	
Basic	- Ollero Baturone, A (2001). Manipuladores y Robots móviles. Marcombo - Barrientos Cruz, Antonio; Peñín Honrubia, Luis Felipe (2007). Fundamentos de Robótica. Mc Graw-Hill - John J, Craig (2006). Robótica.. Pearson Prentice Hall - Torres, F y otros (2002). Robots y Sistemas Sensoriales. Prentice Hall - Peter Corke (2011). Robotics, Vision and Control. Robotics, Vision and Control
Complementary	

Recommendations
Subjects that it is recommended to have taken before

Computer Science/770G01002 Physics I/770G01003 Linear Algebra/770G01006 Physics II/770G01007 Automatic Control Systems/770G01017 Fundamentals of Electronic Circuits/770G01018 Digital Systems I/770G01026
Subjects that are recommended to be taken simultaneously
Automation II/770G01037 Advanced Control/770G01042
Subjects that continue the syllabus
Graduation Proyect /Bachelor Thesis/770G01045
Other comments
To help achieve an immediate sustainable environment and meet the objective of action number 5: "Healthy and sustainable environmental and social teaching and research" of the "Green Campus Ferrol Action Plan":1. The delivery of the documentary works that are made in this matter: 1.1. They will be requested in virtual format and / or computer support   1.2. They will be made through Moodle, in digital format without the need to print them

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.