



Teaching Guide

Identifying Data					2023/24
Subject (*)	Robotics	Code	770G01056		
Study programme	Grao en Enxeñaría Electrónica Industrial e Automática				
Descriptors					
Cycle	Period	Year	Type	Credits	
Graduate	2nd four-month period	Fourth	Optional	4.5	
Language	Spanish				
Teaching method	Face-to-face				
Prerequisites					
Department	Enxeñaría Industrial				
Coordinador	Meizoso López, Maria del Carmen	E-mail	carmen.meizoso@udc.es		
Lecturers	Casteleiro Roca, José Luis Meizoso López, Maria del Carmen	E-mail	jose.luis.casteleiro@udc.es carmen.meizoso@udc.es		
Web					
General description	<p>The following aspects related to robotics will be analyzed:</p> <ul style="list-style-type: none"> - Introduction to robotics and its integration with other 4.0 or emerging technologies - Architecture and main elements of robots - Mobile and/or intelligent autonomous systems 				

Study programme competences / results

Code	Study programme competences / results
A3	Capacidade para realizar medicións, cálculos, valoracións, taxacións, peritaxes, estudos e informes.
A30	Coñecer e ser capaz de modelar e simular sistemas.
A32	Coñecer os principios e aplicacións dos sistemas robotizados.
A33	Coñecemento aplicado de informática industrial e comunicacións.
B1	Capacidade de resolver problemas con iniciativa, toma de decisións, creatividade e razoamento crítico.
B2	Capacidade de comunicar e transmitir coñecementos, habilidades e destrezas no campo da enxeñaría industrial.
B3	Capacidade de traballar nun contorno multilingüe e multidisciplinar.
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.
B7	Capacidade para traballar de forma colaborativa e de motivar un grupo de traballo.
B12	CB5 - Que los estudiantes hayan desarrollado aquellas habilidades de aprendizaje necesarias para emprender estudios posteriores con un alto grado de autonomía.
C1	Expresarse correctamente, tanto de forma oral coma escrita, nas linguas oficiais da comunidade autónoma.
C2	Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C5	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben afrontarse.

Learning outcomes

Learning outcomes	Study programme competences / results		
Understand the importance of robotics in the field of current and emerging industry	A32	B1	C1
	A33	B2	C2
		B5	C5
		B6	
		B12	



Understand the operating principles of robotics	A3 A30 A32	B4 B7	
Ability to use simulation tools and robot programming in a flexible and collaborative industrial environment	A30 A32 A33	B3 B6 B7	
Know and manage intelligent autonomous systems	A30 A32 A33	B6 B7	

Contents	
Topic	Sub-topic
Introduction to robotics and integration with other 4.0 or emerging technologies	Robotics as an enabling technology in Industry 4.0 Collaborative robotics or cobots Trends in industrial robotics
Architecture and elements of robotics	Morphology Model and kinematic control Modeling and dynamic control Programming
Mobile and/or intelligent autonomous systems	Autonomous mobile robots (AMR)

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A32 B1 B2 B12 C1 C5	7	11	18
Problem solving	A3 A30 A33 B3 B4 B5 B6 B7 C2	4.5	11	15.5
Laboratory practice	A30 A32 A33 B3 B4 B7 B12 C1 C2 C5	18	26	44
Supervised projects	A30 A32 B2 B4 B6 B12 C1 C2 C5	7	26	33
Personalized attention		2	0	2

(*)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.
Supervised projects	An individual work was carried out, along with the correction of the work of other colleagues. In addition, this work will have to be presented in class.

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.
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Assessment			
Methodologies	Competencies / Results	Description	Qualification
Laboratory practice	A30 A32 A33 B3 B4 B7 B12 C1 C2 C5	Some tasks established in the subject, within the framework of this methodology	30
Problem solving	A3 A30 A33 B3 B4 B5 B6 B7 C2	Realization of works, exercises and problems	20
Supervised projects	A30 A32 B2 B4 B6 B12 C1 C2 C5	Realization of a practical application developed by the robot, which can be combined with the vision system and other laboratory equipment.	50

Assessment comments
<p>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.</p> <p>For the second opportunity, there will be second deadline for assignments.</p> <p>The evaluation criteria of the early December call will be the same as those of the second opportunity of the previous year.</p> <p>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.</p> <p>The fraudulent completion of tests or assessment activities, once verified, will directly imply that the student will be qualified with "suspension" (numerical grade 0) in the corresponding call for the academic year, whether the offense is committed at the first opportunity as in the second For this, your qualification will be modified in the first opportunity report, if necessary.</p> <p>In case the student commits an infraction in the subject (according to the Student Disciplinary Regulations): the student will be graded with a "fail" (numerical grade 0) in the corresponding exam session, whether the infraction is committed at the first or second opportunity. For this, the student's grade will be modified in the first opportunity report, if necessary.</p>

Sources of information	
Basic	<ul style="list-style-type: none"> - Barrientos y otros (2007). Fundamentos de robótica. Mc Graw-Hill - Ollero Baturone (2001). Manipuladores y Robots móviles. Marcombo - Gerald Cook (2011). Mobile Robots, Navigation, Control and Remote Sensing. IEEE Pres Editorial - Nikolaus Correll (2020). Introduction to Autonomous Robots. Magellan Scienti c
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Automatic Control Systems/770G01017 Fundamentals of Electronic Circuits/770G01018
Subjects that are recommended to be taken simultaneously
Control Engineering/770G01028 Advanced Control/770G01058
Subjects that continue the syllabus
Graduation Proyect /Bachelor Thesis/770G01045
Other comments



Recommendations on sustainability and the environment Students will be taught the importance of ethical principles related to the values of sustainability so that they can apply them not only in the classroom, but also in their personal and professional behaviour. To help achieve an immediate sustainable environment and meet the objective of action number 5: "Healthy, environmentally and socially sustainable teaching and research" of the "Green Campus Ferrol Action Plan": The delivery of the documentary work carried out in this subject: - It will be requested in digital format and/or in computer support. - It will be done through Moodle, in digital format without the need to print it. - If it is necessary to do them on paper: o No plastics will be used. o Double-sided printing will be used. o Recycled paper should be used. o Drafts should not be printed. Sustainable use of resources and prevention of negative impacts on the natural environment should be made. Recommendations on Gender Equality and respect for diversity- According to the different regulations applicable to university teaching, the gender perspective must be incorporated in this subject (non-sexist language will be used, bibliography of authors of both sexes will be used, the intervention of male and female students in class will be encouraged...)- We will work to identify and modify sexist prejudices and attitudes, and we will influence the environment to modify them and promote values of respect and equality.- Situations of gender discrimination will be detected and actions and measures to correct them will be proposed.- The full integration of students who, for physical, sensory, mental or socio-cultural reasons, experience difficulties in gaining suitable, equal and beneficial access to university life will be facilitated.

(*)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.