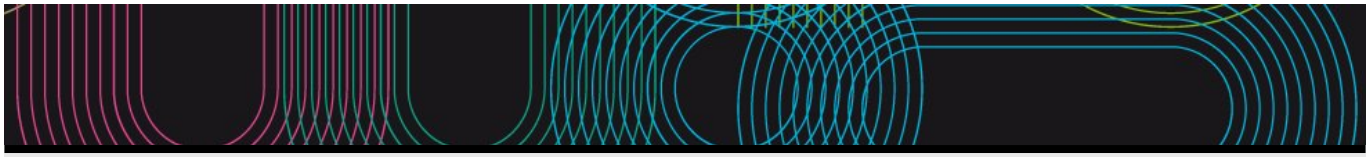

IDENTIFYING DATA				
(*)Robótica médica				
Subject	(*)Robótica médica			
Code	V04M192V01206			
Study programme	Máster Universitario en Ingeniería Biomédica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4.5	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Paz Domonte, Enrique			
Lecturers	Armesto Quiroga, José Ignacio López Fernández, Joaquín Paz Domonte, Enrique			
E-mail	epaz@uvigo.es			
Web				
General description	The main elements of robotic systems in the field of biomedical engineering are presented. Concepts related to the architecture, modeling, programming and operation of robots, both manipulator arms and mobile robots, in the field of medicine, healthcare and hospital environments.			

Skills	
Code	
A5	Students must possess the learning skills that enable them to continue studying in a way that will be largely self-directed or autonomous.
B3	Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.

Learning outcomes	
Expected results from this subject	Training and Learning Results
Knowledge of the principles of medical robotics and its main systems	B3
Ability to apply techniques for the representation of spatial location: position and orientation	A5 B3
Ability to analyze kinematically and dynamically robotic equipment	A5 B3
Applied knowledge of robotics programming and control techniques.	B3
Knowledge of the principles of human-machine interaction, healthcare robotics, robotic applications in surgery and auxiliary techniques (augmented-virtual reality, image-guided simulators-trainers)	B3

Contents	
Topic	
1. Introduction to the medical robotics	(*)Introducción a la robótica médica
2. Morphology of the robot	(*)Morfología del robot
3. Representation of the space location: position and orientation	(*)Representación de la localización espacial: posición y orientación
4. Robot kinematics: direct, reverse, and differential	(*)Cinemática: directa, inversa, modelo diferencial
5. Introduction to robot dynamics	(*)Introducción a la dinámica
6. Robot programming and control techniques	(*)Control y programación de robots
7. Mobile and service robotics	(*)Robótica móvil y de servicios
8. Human-machine interaction. Teleoperation. Haptic systems.	(*)Interacción hombre□máquina. Teleoperación. Sistemas hápticos.

9. Healthcare robotics. Prosthesis and orthotics. Rehabilitation. Muscular assistance. Exoskeletons.	(*)Robótica asistencial. Prótesis y órtesis. Asistencia muscular. Rehabilitación. Exoesqueletos.
10. Robotics in surgery. Vision assisted and vision guided surgery. Endoscopy.	(*)Robótica en cirugía. Cirugía guiada por imagen. Endoscopios.
11. Auxiliary theniques. Virtual reality and augmented reality. Haptic perception in surgery. Simulation and training.	(*)Técnicas auxiliares. Realidad virtual y aumentada. Percepción háptica en cirugía. Simuladores/entrenadores.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	20	40	60
Problem solving	4	8	12
Laboratory practical	12	18	30
Objective questions exam	3	0	3
Essay	0	7.5	7.5

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Lectures in classroom with the help of technical means: blackboard, computer and projector
Problem solving	Resolution of problems in classroom with the help of technical means: blackboard, computer and projector.
Laboratory practical	Laboratory practices in the technological laboratories of the Department of Systems Engineering and Automation or in the computer laboratories of the School of Industrial Engineering

Personalized assistance

Methodologies	Description
Lecturing	Attention to queries and answers to doubts and questions asked while teaching lecture lessons
Problem solving	Attention to queries and answers to doubts and questions asked while solvign problems in classroom
Laboratory practical	Attention to the queries and answer to the questions made during the practices in laboratory

Assessment

	Description	Qualification	Training and Learning Results	
Problem solving	The resolution of problems in the classroom can serve for the continuous evaluation of the students. Maximum 1 point out of 10.	0	A5	B3
Laboratory practical	Laboratory practices are considered mandatory. The work done in the laboratory practices, as well as the previous work or the subsequent deliverables (when requested), constitute the fundamental part of the continuous evaluation.	20	A5	B3
Objective questions exam	Written exam on the date established by the official exam calendar. It may consist of multiple choice questions, short answer questions, development questions, and problem solving questions. It will be necessary to achieve a minimum in each part (typically 40%), in order to pass the exam.	80		
Essay	Voluntary work to improve grades. Maximum 1 point out of 10	0		

Other comments on the Evaluation

Laboratory practices are considered mandatory.

To pass the subject in the first call, it is necessary to have attended at least 80% of the laboratory practices, and to have obtained an average grade of practices (including deliverables) greater than or equal to 5.

In case of not passing the practices in continuous evaluation, and for the students who renounce the continuous evaluation, it will be necessary to submit to an additional laboratory exam, once the official exam has been passed.

Sources of information

Basic Bibliography

Barrientos, Peñin, Balaguer, Aracil, **Fundamentos de Robótica**, Mc-Graw-Hill, 2007

Achim Schweikard, Floris Ernst, **Medical Robotics**, 978-3-319-22890-7, Springer, 2015

Complementary Bibliography

Varios, **Latest Developments in Medical Robotics Systems**, 978-1839693823, Colección de artículos, Intechopen, September 15, 2021

Recommendations

Subjects that are recommended to be taken simultaneously

(*)Control e regulación das funcións corporais/V04M192V01202

Subjects that it is recommended to have taken before

(*)Modelado e simulación sistemas biomédicos/V04M192V01103

(*)Simulación biomecánica/V04M192V01308