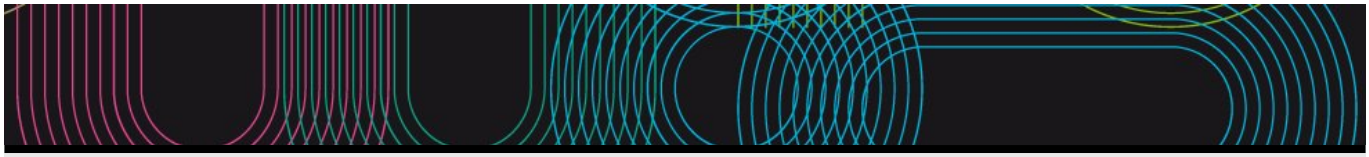
Universidade Vigo

Subject Guide 2022 / 2023



IDENTIFYING DATA				
(*)Control e regulación das funcións corporais				
Subject	(*)Control e regulación das funcións corporais			
Code	V04M192V01202			
Study programme	Máster Universitario en Ingeniería Biomédica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4.5	Mandatory	1st	2nd
Teaching language				
Department				
Coordinator	Delgado Romero, Mª Emma			
Lecturers	Delgado Romero, Mª Emma			
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Web				
General description	(*)La asignatura centra su contenido en el análisis y desarrollo de técnicas de control automático clásico y avanzado aplicables en la regulación de las denominadas grandes funciones corporales.			

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.
C8	Knowledge and ability to know methods of control and regulation and to apply advanced dynamic analysis techniques.

Learning outcomes	
Expected results from this subject	Training and Learning Results
To know the control systems in biomedicine: Analysis and design in the time and frequency domain.	B3 C8
To apply controllability and state estimation methods	A5 C8
To know and to apply advanced techniques of dynamic analysis and control.	A5 B3 C8

Contents	
Topic	
Subject 1. Control and regulation systems of corporal functions	Introduction, concepts, aims and applications. Modelling review of linear systems in continuous and discreet time. Stability concept, transitory and permanent. Diagram and computational tools for analysis and temporary design.
Subject 2. Frequency analysis and design	Frequency response function. Stability Criterion. Relative stability. Diagrams and computational tools for analysis and design in frequency.
Subject 3. Modelling, analysis and design in state variables	Controlability and observability. States feedbacks. Allocation of poles. Design of asymptotic observers. Principle of separation.
Subject 4. LQR regulator and Kalman filter	Optimum control: linear quadratic regulator (LQR) and optimum estimate Kalman filter.
Subject 5. Technicians advanced of dynamic analysis and control	Applications in physiological systems.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	24	40	64
Laboratory practical	12	32.5	44.5
Essay questions exam	4	0	4

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

Methodologies	
	Description
Lecturing	Theory classes with support of audiovisual means: cannon, portable computer and Internet connection
Laboratory practical	They will make four sessions of laboratory, each one of three hours, where the student will put in practice and will simulate the technicians and applications developed in the theory classes. In general, the student will develop a previous work to each session, the work of laboratory and a brief memory of results, as it indicate in each case.

Personalized assistance	
Methodologies	**Description**
Lecturing	Personalised attention during the sessions of the classroom and in schedule of tutorials to attend the doubts and queries to the didactic material proposed in the matter and its application to practical cases.
Laboratory practical	Personalised attention during the sessions of the laboratory and in schedule of tutorials to attend the doubts related with the practices to develop.
Tests	**Description**
Essay questions exam	Personalised attention during the realisation of the proofs to attend the doubts in the billed interpretation.

Assessment					
	Description	Qualification	Training and Learning Results		
Laboratory practical	Continuous evaluation of the matter. The final mark is the average of the marks obtained in the sessions.	20	A5	B3	C8
Essay questions exam	Long answer and/or development questions, and/or problems/exercises.	80		B3	C8

Other comments on the Evaluation

To pass the matter the student has to obtain at least 5 points on 10 in the total mark of any call.

Sources of information

Basic Bibliography

L.Moreno, S.Garrido, C.Balaguer,, **Ingeniería de Control**, Ariel, 2003

J. Fernández de Cañete, C.Galindo, J. Barbancho, A. Luque, **Automatic control systems in biomedical engineering**, Springer, 2018

Complementary Bibliography

Astrom, Murray, **Feedback Systems**, Princeton University Press, 2008

Recommendations

Subjects that it is recommended to have taken before

(*)Modelado e simulación sistemas biomédicos/V04M192V01103