

## SUBJECT TEACHING GUIDE

### G739 - Automatic Control Systems

### Degree in Mechanical Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Mechanical Engineering			Type and Year	Compulsory. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Electronics and Automation Module in Common with the Industrial Branch				
Course unit title and code	G739 - Automatic Control Systems				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web	<a href="https://moodle.unican.es/course/view.php?id=3544">https://moodle.unican.es/course/view.php?id=3544</a>				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. TECNOLOGIA ELECTRONICA E INGENIERIA DE SISTEMAS Y AUTOMATICA				
Name of lecturer	LUCIANO ALONSO RENTERIA				
E-mail	luciano.alonso@unican.es				
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO (S2022)				
Other lecturers	ELIAS REVESTIDO HERRERO				

### 3.1 LEARNING OUTCOMES

- Starting from the principles and mathematical techniques used in Control Engineering, to get to know the methods of analysis and design in the temporal domain and in the frequency domain.  
Knowledge of some software tools for modeling and simulation of systems.

### 4. OBJECTIVES

Achieve the learning results described in section 3.1 of the subject.

6. COURSE ORGANIZATION	
CONTENTS	
1	<p>INTRODUCTORY CONCEPTS</p> <p>Introduction to Methods and Techniques for Industrial Control .</p> <p>Control systems.</p> <p>Industrial Automation: Definition, Types and Classification, Technology and examples.</p>
2	<p>MODELING OF SYSTEMS AND TRANSFER FUNCTION.</p> <p>The Laplace transform.</p> <p>Mathematical model of physical systems. Transfer function.</p> <p>Block diagrams</p> <p>Linearization of non-linear systems.</p>
3	<p>TEMPORARY ANALYSIS OF CONTINUOUS SYSTEMS.</p> <p>Stability analysis</p> <p>Response analysis in steady state.</p> <p>Analysis of response in transitory regim</p>
4	<p>BASIC CONTROL ACTIONS.</p> <p>Control in open loop and closed loop.</p> <p>Control all-nothing.</p> <p>PID control.</p> <p>Experimental tuning of PID regulators.</p>
5	<p>THE METHOD OF THE ROOTS LOCUS.</p> <p>Introduction.</p> <p>Properties of the roots locus.</p> <p>Rules for the construction of the roots locus.</p> <p>Inverse roots locus.</p> <p>Generalized roots locus.</p> <p>Contour of the roots.</p> <p>Design of regulators through the roots locus.</p>
6	<p>FREQUENCY ANALYSIS OF CONTROL SYSTEMS.</p> <p>Introduction.</p> <p>Sinusoidal transfer function.</p> <p>Representation diagrams of the frequency response.</p> <p>Plotting of the asymptotic Bode diagram.</p> <p>Stability analysis in the frequency domain.</p> <p>Operating specifications in the frequency domain.</p> <p>Design of regulators in the frequency domain.</p>

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
First control theory	Written exam	No	Yes	30,00
First practical control	Laboratory evaluation	No	Yes	20,00
theory final exam	Written exam	Yes	Yes	30,00
Final practical exam	Laboratory evaluation	Yes	Yes	20,00
TOTAL				100,00
Observations				
Given the uncertain current health situation, in the event that the competent health and educational authorities so indicate, not allowing the development of any evaluation activity in person in the classroom, a distance evaluation modality will be adopted using telematic means.				
Observations for part-time students				
Students enrolled part-time may choose to be evaluated using the method described above for other students, or through a single final exam, which will consist of a written part of theory (60% of the weight) and a part of laboratory practices.				

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

INSTRUMENTATION AND CONTROL SYSTEMS. W. Bolton  
 INGENIERÍA DE CONTROL MODERNA. K. Ogata  
 SISTEMAS DE CONTROL AUTOMÁTICO. B.C. Kuo  
 SISTEMAS CONTINUOS DE CONTROL. J.M. Pérez Oria  
 PROBLEMAS DE INGENIERÍA DE SISTEMAS CONTINUOS. CONCEPTOS BASICOS. J.R. Llata García, E. González Sarabia, D. Fernández Pérez, J. Arce Hernando, J.M. Pérez Oria (Disponible en OCW:  
<http://ocw.unican.es/enseñanzas-tecnicas/automatica>)