SUBJECT TEACHING GUIDE

G831 - Instrumentation and Process Control Electronics

First Degree in Telecommunication Technologies Engineering

Academic year 2026-2027

1. IDENTIFYING DATA					
Degree	First Degree in Telecommunication Technologies Engineering			Type and Year	Optional. Year 3
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Applied Electronics				
Course unit title and code	G831 - Instrumentation and Process Control Electronics				
Number of ECTS credits allocated	6	Term		Semester based (2)	
Knowledge Field	Electrical engineering, electronic engineering and telecommunications engineering				
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERÍA INFORMÁTICA Y ELECTRÓNICA
Name of lecturer	M. MERCEDES GRANDA MIGUEL
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Other lecturers	ALBERTO PURAS TRUEBA MARIA SANDRA ROBLA GOMEZ

4. OBJECTIVES

The course, with a strong practical orientation, aims to introduce students into electronic measurement and control systems. The objectives are oriented in four directions:
- Study the components, architectures and standards of electronic measurement systems. Analyze and design electronic circuits used in electronic instrumentation and interconnect these circuits to build electronic measurement systems.
- The student must be able to use the data sheets of electronic circuits to extract and interpret data provided by manufacturers and know how they affect the real behavior of electronic systems.
- The student will be able to characterize the measurement and measure skillfully using laboratory electronic instrumentation, both manually and programming instruments with a computer, and know how to evaluate the effects that the interference and real characteristics of the equipment produce on measurement processes.
- Introduce students into the basic tools of analysis and design of dynamic control systems. The analysis and design methods are developed in the time domain and frequency domain.

6. SUBJECT PROGRAM

CONTENTS	
1	FIRST PART: ELECTRONIC INSTRUMENTATION
1.1	CHAPTER 1. INTRODUCTION TO ELECTRONIC INSTRUMENTATION AND MEASUREMENT TECHNIQUES. Components and architecture of electronic measurement systems. Instrumentation systems regulations. Digital measurement systems. Virtual instrumentation. Static, dynamic and input characteristics of instrumentation systems. Errors and characterization of the measure.
1.2	CHAPTER 2. SIGNAL CONDITIONING. Noise and interference. Instrumentation amplifiers. Analog filters.
1.3	CHAPTER 3. Transducers. Temperature transducers. Force transducers. Position transducers.
2	SECOND PART: ELECTRONIC CONTROL
2.1	CHAPTER 4: INTRODUCTION TO CONTROL SYSTEMS. Introduction. General concepts. Application of the Laplace transform. Mathematical models of physical systems. Transfer function. Linearization of nonlinear models. Block diagrams. Multivariable systems.
2.2	CHAPTER 5: ANALYSIS OF CONTROL SYSTEMS Time response. Dynamic and steady-state behavior. Errors. Type and static accuracy of a system. Response of first and second order systems. Higher order systems. Stability concept. Methods to determine stability. Routh-Hurwitz method. Basic control actions: proportional, derivative and integral control. Tuning PID for process control.
2.3	CHAPTER 6: ROOT LOCUS AND FREQUENCY RESPONSE. Root locus. Modular and angular conditions. Construction of the root locus. Calculation of regulators by the method of root locus. Bode diagram. Amplitude and phase margins. Relationship between frequency response and transient response. Lead and lag phase compensation networks.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
THEORY EXAM OF THE FIRST PART	Written exam	No	Yes	30,00
THEORY EXAM OF THE SECOND PART	Written exam	No	Yes	30,00
LABORATORY PRACTICES EXAM OF THE SECOND PART	Laboratory evaluation	No	Yes	20,00
LABORATORY PRACTICES CONTINUOUS ASSESSMENT OF THE FIRST PART	Laboratory evaluation	No	No	20,00
TOTAL				100,00

Observations

The subject consists of two different parts that are evaluated separately. The first part of the subject is made up of the theory and practices of topics 1, 2 and 3 and the second part of the theory and practices of topics 4, 5 and 6. Each of these two parts will contribute with a 50% to the final mark

To pass the subject it is necessary to obtain a weighted average grade equal to or greater than 5.0 (see details in assessment methods). If this condition is not verified, students will be able to take the final exams, both in the Ordinary and Extraordinary Calls, for the recoverable activities necessary to achieve the minimum average grade of 5.0 required..

Finals exams of the theory of each part of the course will consist of a written test in which the students will have to resolve issues and problems.

Observations for part-time students

Part-time students will be governed by the same rules as full-time students.

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

GRANDA M. y MEDIAVILLA E., Instrumentación Electrónica: Transductores y Acondicionadores de señal. PUbliCan, Ediciones de la Universidad de Cantabria, Santander, 2010.

PÉREZ ORIA, J.M., Sistemas Continuos de Control. TGD 1992

LLATA J.R., GLEZ. SARABIA E., FDEZ. PÉREZ D., ARCE HERNANDO J. y PÉREZ ORIA J.M., Problemas de Ingeniería de Sistemas: Sistemas continuos. TGD 1999

LLATA J.R., PÉREZ ORIA J.M. y GLEZ. SARABIA E., Matlab y Simulink para Ingeniería de Sistemas. TGD 1999