

# SUBJECT TEACHING GUIDE

## G740 - Electronics

### 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	G740 - Electronics				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Web	<a href="https://moodle.unican.es/course/view.php?idnumber=G740_2223">https://moodle.unican.es/course/view.php?idnumber=G740_2223</a>				
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. TECNOLOGIA ELECTRONICA E INGENIERIA DE SISTEMAS Y AUTOMATICA
Name of lecturer	YOLANDA LECHUGA SOLAEGUI
E-mail	yolanda.lechuga@unican.es
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 3. DESPACHO PROFESOR (S3082)
Other lecturers	MARIA DEL MAR MARTINEZ SOLORZANO JUAN ECHEVARRIA CUENCA ALEJANDRO NAVARRO CRESPIN

3.1 LEARNING OUTCOMES
- Abilities for the use of passive components
- Abilities for the use of electronic instruments
- Abilities for the analysis and design of electronic circuits

#### 4. OBJECTIVES

Introducing the fundamentals of analog and digital electronics. Learning to analyze and to design basic analog and digital circuits
Acquiring experience in using laboratory elements and electronic instruments
Acquiring experience in designing electronic circuits and acquiring the ability to read experimental data.
Development of the abilities to propose electronic-based solutions applied to the specifications of the industrial engineering

#### 6. COURSE ORGANIZATION

CONTENTS	
1	Digital Electronics: - Digital vs. Analog - Combinational Logic: Boole's Algebra, truth tables, minimization, logic operations and memory cells.
2	Introduction to semiconductors and active devices (diodes and transistors): Characteristics of the PN junction. Junction diode and Zener diode. Structure and physical operation of MOS transistors. Current-voltage characteristics. Small-signal models
3	Sequential Logic: - Memory elements and programmable systems - Introduction to sequential circuits, PAL, PLAs, FPGAs
4	Introduction and basic laws for electronic circuits: Notation. Ohm's Law and Kirchoff's Laws. Shunt and series connection. Voltage and current dividers. Passive components: capacitors and inductances.
5	MOS Amplifiers: Biasing and basic single-stage configurations
6	Operational Amplifiers: Ideal OpAmps, real OpAmps. Inverting and Non-inverting amplifier. Summer and difference amplifiers. Integrator, differentiator. Comparator.
7	Circuits with diodes: Diode models and analysis of circuits with diodes.
8	Filters and analog-to-digital converters: - Filters: First and second-order filters. Design of low-pass, high-pass, bandpass and bandstop filters. - Analog-to-digital conversion: Digital signal processing. Signal sampling and quantization. Conversion methods A/D and D/A.

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Exam for Block 2	Written exam	Yes	Yes	30,00
Hands-on lab sessions	Laboratory evaluation	No	Yes	30,00
Ongoing assessment	Others	No	Yes	10,00
Exam for Block 1	Written exam	Yes	Yes	30,00
TOTAL				100,00

### Observations

In order to pass the course, it is essential to pass the lab program.

The grade for the course in the ordinary call will be obtained as a weighted average of the grades achieved in the evaluation activities.

In the extraordinary call, the ongoing assessment and the exam for Block 1 can be overcome by adding their percentages to the weight of a final written exam.

The laboratory program may be overcome by means of a practice exam that will take place in an extraordinary call.

In case the sanitary conditions required it, the assessment will move from a presence-based to a virtually-supported modality, according to a mixed teaching format or, in the most extreme case where the presence-based activities were discouraged, these will be developed by telematic means through the virtual classroom (Aula Virtual – Moodle), email, Skype for Business, Microsoft Teams and/or any tool provided or allowed by the University of Cantabria for the assessment, or to guarantee the validity of the exams.

The relative weights for each activity included in the assessment method of the course are maintained for all the described teaching modalities.

Thus, the students must have a computer with a webcam and a microphone, or a smartphone with a built-in camera, internet connection, Microsoft Teams and/or any tool provided or allowed by the University of Cantabria.

### Observations for part-time students

For those students with part-time enrollment who cannot attend the scheduled lab sessions for justifiably reasons, the lab program could be passed by a separate practical exam that will take place at the ordinary examination session.

Besides, for those students with time incompatibilities and part-time enrollment, a telematic follow-up and personal tutoring will be developed.

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

A. S. Sedra, K. C. Smith, Circuitos Microelectrónicos. McGraw Hill (5ª Ed), 2006

R.H. Katz, G. Borriello, Contemporary Logic Design, Pearson Education, 2005