

SUBJECT TEACHING GUIDE

G288 - Electronic and Photonic Devices

Degree in Telecommunication Technologies Engineering

First Degree in Telecommunication Technologies Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Telecommunication Technologies Engineering First Degree in Telecommunication Technologies Engineering			Type and Year	Core. Year 1 Core. Year 1
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Electronics Basic Training Module				
Course unit title and code	G288 - Electronic and Photonic Devices				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Knowledge Field					
Web					
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	ADOLFO COBO GARCIA				
E-mail	adolfo.cobo@unican.es				
Office	Edificio Ing. de Telecomunicación Prof. José Luis García García. Planta: - 3. DESPACHO PROFESORES (S324)				
Other lecturers	OLGA MARIA CONDE PORTILLA FRANCISCO JAVIER MADRUGA SAAVEDRA MARIA ANGELES QUINTELA INCERA				

4. OBJECTIVES

To appreciate the relevance of electronics and photonics in telecommunications and society in general .
Understand the operating principles, analyze the behavior, and learn the details and construction varieties, functions, and applications of the most representative electronic and photonic devices.
Identify, decode, and select the most appropriate devices for specific applications.

To apply basic knowledge of conduction and semiconductor physics to understand the behavior and limitations of devices .
Know static and dynamic models to describe the behavior of devices.
Analyze I-V curves of devices.

To understand the concept of the operating point and design basic bias circuits for bipolar and unipolar transistors .
Analyze the behavior of basic electronic circuits that include bipolar and unipolar transistors, in both static and small-signal regimes.
Understand the issue of heat generation in devices and design appropriate mitigation strategies.

To design and build basic circuits with devices and measure their behavior in the laboratory using electronic instrumentation (oscilloscope, multimeter, function generator, power supply), comparing the measurements with the behavior predicted by the design.
Develop strategies to approach the design or analysis of a circuit with electronic and photonic devices, as well as to detect and resolve faults in electronic circuits.

To work cooperatively to design circuits with electronic and photonic devices that enable a micro -robot to execute a pre-designed strategy, and defend it orally.
Write structured technical reports using clear and precise technical language , with appropriate presentation and references.

6. SUBJECT PROGRAM

CONTENTS

1	Fundamentals: Electronics and photonics in telecommunications Analog and digital signals Current and voltage; power and energy in circuits Electrical supply and circuit power Kirchhoff's laws and superposition Static, transient, AC/DC behavior RLC circuits Thevenin and Norton equivalents Input and output impedance Dependent sources.
2	Electronic and Photonic Devices: Device parameters and standardization I-V curve of two and three terminal devices Static, dynamic, small signal, and large signal models Bias point, static and dynamic resistance Thermal behavior Reliability Basic models of: Passive devices Active devices Bipolar transistors Unipolar transistors Photonic and optoelectronic devices Other devices.
3	Semiconductors, PN Junction, and Diodes: Conduction in solids Semiconductor materials Intrinsic and extrinsic semiconductors PN junction Diodes Applications of diodes
4	Bipolar Junction Transistor (BJT): Configuration and operating regions Characteristic curves and biasing Static and small signal models Applications
5	Unipolar Transistors (JFET, MOSFET, MESFET): Configuration and operating regions Characteristic curves and biasing Static and small signal models CMOS circuits and logic gates Other applications

6	Photonic Devices: Optical fiber LED and laser diodes LDR, photodiodes, phototransistors Optocoupler Photovoltaic cell Applications
7	Cooperative activity (micro-robot)

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Continuous assesment: Classroom activities or at home throughout the semester	Others	No	Yes	30,00
Topic tests (exams at the end of each topic 2 to 6)	Others	No	Yes	40,00
Individual lab test	Laboratory evaluation	No	Yes	10,00
Assessment of in-lab activities and results.	Others	No	No	10,00
Assessment of the cooperative activity (micro-robot)	Laboratory evaluation	No	No	10,00
Final exam. The evaluation of this exam could substitute the evaluation of "continuous assessment" and "Topic tests (2 to 6)", with the same total weight (70%)	Written exam	Yes	Yes	0,00
TOTAL				100,00
Observations				
The final exam can substitute the 'continuous assessment' and the 'topic tests' with the same weight in the overall course grade (70%). Students who have met the minimum grade in both assessment items may choose not to take the final exam in either the regular or extraordinary calls.				
The weight of the 'topic tests' in the grade will be between 6% and 10% each, depending on the hours dedicated to each topic, totaling 40%. The weight of each continuous assessment test in the grade will depend on the difficulty of each and the total number conducted, totaling 30%.				
The overall grade for the course will be the weighted sum of the grades of each assessment item with their respective weights.				
Observations for part-time students				
The same as full-time students.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Electrónica: teoría de circuitos y dispositivos electrónicos / robert Boylestad, Louis Nashelsky, 2018, 11ª ed
 Componentes Electrónicos, Felipe Espinosa y otros, Servicio de publicaciones, Universidad de Alcalá 3ª edición.
 Problemas resueltos de tecnología y componentes electrónicos y fotónicos / J.C. Ferrer ... [et al.]. básica 2006
 Dispositivos electrónicos : problemas resueltos / Juan Bautista Roldán Aranda, Fco. Jesús Gámiz Pérez 2001
 Make: Electronics: Learning by Discovery: A Hands-On Primer for the New Electronics Enthusiast, Charles Platt, 2009.
 Selección de componentes en electrónica, Jean-François Machut, 2006

