SUBJECT TEACHING GUIDE

G700 - Electronics

Degree in Industrial Technologies Engineering

Academic year 2023-2024

1. IDENTIFYING DATA					
Degree	Degree in Industrial Technologies 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	G700 - Electronics				
Number of ECTS credits allocated	6	Term		Semester based (2)	
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	JOSE ANGEL MIGUEL DIAZ
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Other lecturers	YOLANDA LECHUGA SOLAEGUI IÑIGO UGARTE OLANO

3.1 LEARNING OUTCOMES
- The ability to simulate and use electronic devices.
- The ability to design basic analog electronic circuits.
- The ability to assemble and test electronic circuits.

4. OBJECTIVES
Introducing the fundamental concepts of analog electronics. Learning how to analyze and design basic analog electronic circuits.
Acquiring experience in the use of the electronics laboratory equipment and devices.
Acquiring experience in the use of electronics simulation software, as well as in the analysis of both simulation and experimental-based results.
Developing the required skills to propose electronic solutions to Industrial Engineering-related challenges.

6. COURSE ORGANIZATION	
CONTENTS	
1	Introduction and basic laws for the modeling and analysis of electronic circuits. Notation basics. Fundamental analysis laws and theorems: current-voltage characteristics of electronic devices (I-V curve); Ohm's law; models for non-linear electronic devices; Kirchhoff's circuit laws; shunt and series connection of electronic devices. Voltage and current divider circuits. Passive electronic devices: capacitors and inductances. Amplification concepts: voltage gain; input impedance; output impedance.
2	Introduction to semiconductors and electronics devices: diodes and transistors. Characteristics of the PN junction diode. Fundamentals on the behavior of PN Junction diodes and Zener diodes. Description of diode models; analysis of diode circuits using diode models.
3	The MOS transistor: device structure and its physical operation. Biasing and small-signal operation model. The MOS transistor as an ideal switch.
4	Introduction to MOS amplifiers: circuit biasing and basic single-stage amplifier configurations. Analysis of the voltage amplifier model: voltage gain; input impedance; output impedance. Design and analysis of MOS integrated circuit single-stage amplifiers. Two-stage amplifiers. The differential amplifier. Frequency response of MOS amplifiers.
5	Operational Amplifiers (OpAmp): ideal OpAmp; real OpAmp. OpAmp based circuits: inverting and non-inverting amplifier circuits; adder and subtractor circuits; integrator and differentiator circuits; comparator circuits. Non-linear applications of the OpAmp. The trasconductance Amplifier (OTA).
6	Introduction to active filters: design and analysis of low-pass, high-pass, bandpass and stop-band filters. Design and analysis of Biquad filters and Cascade filters.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Hands-on laboratory sessions.	Laboratory evaluation	No	Yes	30,00
Continuous evaluation.	Others	No	Yes	30,00
Final exam.	Written exam	Yes	Yes	40,00
TOTAL				100,00

Observations

If the minimum acceptable grade is not obtained in any of the evaluation activities, then the highest possible grade would be a 4,9.
Any passing grades given during the evaluations will be valid until the “Convocatoria Extraordinaria” of the course.
In order to pass the course, a passing grade in the laboratory class is required as well.
In order to provide a safe and accessible learning environment, the course may not be in-person. If that is the case, then the course will be either an online course or a hybrid course (a mix of in-person meetings and online activities).
If the course is delivered online or hybrid, then class activities will be done via Aula Virtual (Moodle), email, Skype for Business, and/or any other software that the University of Cantabria permits or provides.
Any tutoring session/discussion with students will be delivered online or hybrid via email or the Aula Virtual’s forum . If need be, the use of Skype for Business and/or any other software that the university provides or permits maybe used.
Any online or hybrid evaluations will be based on the “Evaluación con Soporte Virtual” for each graded assignment . The weight percentage for each graded assignment will remain the same.
All students must have a computer, webcam and microphone or a mobile phone with camera, access to the internet, and Skype for Business and/or any other software that the University of Cantabria provides or permits.

Observations for part-time students

For part-time students, the percentages assigned to the evaluations are added to the written exams.
For any part-time student whose schedule is incompatible, individual online meetings will be carried out.
If any part-time student who for justified reasons cannot attended the scheduled lab sessions, the possibility of passing the lab component through practical exams that will be held during the “Convocatoria Ordinaria” and “Convocatoria Extraordinaria”

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

A.S. Sedra, K.C. Smith. Microelectronic Circuits. Oxford University Press, 2011.