COMILLAS
UNIVERSIDAD PONTIFICIA
ICAI ICADE CIHS

Syllabus
2022 - 2023

GENERAL INFORMATION

Data of the subject	
Subject name	Electronics
Subject code	DEA-GITI-222
Mainprogram	Bachelor's Degree in Engineering for Industrial Technologies
Involved programs	Grado en Ingeniería en Tecnologías Industriales y Grado en Administración y Dirección de Empresas [Second year] Grado en Ingeniería en Tecnologías Industriales [Second year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	7,5 ECTS
Type	Compulsory
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Coordinator	José Daniel Muñoz Frías
Office hours	Request an appointment by email

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DESCRIPTION OF THE SUBJECT

Contextualization of the subject

Prerequisites

Analysis of electrical circuits.

Course contents

Contents

Analog Electronics

Electronic systems, analog and digital signals. Frequency response: basic concepts.

- Signal concept. Introduction to transducers, signal conditioning and electronic systems.
- Representation of signals in the frequency domain. Basic concepts of frequency response. Filtering with first order networks.
- Power of a signal.

Amplifiers and operational amplifiers

- Ideal amplifiers and basic characteristics: gain, input and output resistance and efficiency.

- Operational amplifiers in open loop or with positive feedback: comparators.
- Operational amplifiers in closed loop: basic configurations, and application to signal conditioning.

Diodes, rectifiers and voltage regulators

- Ideal diode and circuits with diodes.
- Real diode. Modelling with constant voltage drop.
- Rectifier circuits.
- Zener diode and voltage regulators.

Digital Electronics

Introduction to digital systems

- Introduction to digital systems.
- Analog and digital signals. Sampling theorem.
- Binary systems. Positive and negative logic. Classification of digital systems.
- Numbering systems.
- Logic gates, truth tables, and Boolean logic.
- Design of combinational digital systems and simplification using Karnaugh diagrams.
- Input and output elements: push buttons, transistors, relays, etc.
- Basic combinational circuits: multiplexers and demultiplexers, encoders and decoders, etc.

Microprocessor-based systems

- Structure and basic blocks of a microprocessor.
- Basic principles of microprocessor programming.
- Application to the implementation of logical functions.
- State machines.
- Implementation of state machines in a microprocessor system.

Laboratory

- Lab 1. Introduction to the PSpice simulator.
- Lab 2. Introduction to the laboratory.
- Lab 3. Transducer I.
- Lab 4. Filtering.
- Lab 5. Transducer II.
- Lab 6. Amplification and detection.
- Lab 7. Op-Amp with single power supply.
- Lab 8. Introduction to microcontrollers.
- Lab 9. Final project.

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
	• Understanding of concepts.	

Final exam	• Application of concepts to the resolution of practical problems. • Analysis and interpretation of the results obtained in the resolution of problems. • Presentation and written communication.	45 %
Mid-grade exam	• Understanding of concepts. • Application of concepts to the resolution of practical problems. • Analysis and interpretation of the results obtained in the resolution of problems. • Presentation and written communication.	20 %
Laboratory	• Ability to design, assemble and check electronic circuits and systems. • Presentation and written communication. • Team work capacity.	35 %

Grading

Final grade

Theory: a continuous evaluation is carried out based on the following tests:

- Mid-term exam (EI).
- Final exam (EF1).

The final grade is obtained as follows:

- If EF1≥4 then:
  - T = 0.3×EI+0.7×EF1
- If EF1<4 then:
  - T = Min(0.3×EI+0.7×EF1 , EF1)

Laboratory: two reports are made throughout the course:

- A first report (I1) with the results of practices 1 to 6.
- A final report (IF) with the results of the final project.

In addition to the reports, the student's work in the laboratory (TL) is evaluated, where the completion of the previous work, the functioning of the practices, the student's attitude in the laboratory, etc. are taken into account.

The final laboratory grade is obtained according to the following formula:

- L = 0.3 I1 + 0.3 IF + 0.4 TL

The laboratory grade (L), if pass, is maintained for the extraordinary evaluation.

Final grade: 0.65×T + 0.35×L, with a minimum grade of 5 in both theory (T) and laboratory (L).

Extraordinary evaluation

In the extraordinary evaluationl, the theory grade will be obtained from the final exam of the extraordinary evaluation (EF2) as follows:

- If EF2≥4 then:
  - T = 0.2×EI+0.8×EF2
- If EF2<4 then:
  - T = Min(0.2×EI+0.8×EF2, EF2)

If the laboratory failed in the final grade, a practical laboratory exam will be carried out. The grade of said exam will be the new laboratory grade (L).

The extraordinary evaluation grade is obtained in the same way as in the final grade:

Extraordinary grade: 0.65×T + 0.35×L, with a minimum grade of 5 both in theory (T) and in laboratory (L).

Attendance Rules

Class attendance is mandatory, according to the Academic Regulations of ICAI. The attendance requirements will be applied independently for the theory and laboratory sessions:

- In the case of theory sessions, failure to comply with this rule may prevent taking the exam in the ordinary call.
- In the case of laboratory sessions, failure to comply with this rule may prevent them from taking the exam in the ordinary and extraordinary calls. In any case, unjustified absences from laboratory sessions will be penalized in the evaluation.

BIBLIOGRAPHY AND RESOURCES

Basic References

- Subject slides (available on the course website).
- Sedra-Smith, Microelectronic Circuits, 5ª ed., Oxford U. P., 2006.
- José Daniel Muñoz Frías, Introducción a los sistemas digitales (available on the course website).

CRONOGRAMA ORIENTATIVO ELECTRONICA. Segundo GITI

PROGRAMA DE TEORIA	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S.S.	S14	S15
Tema 1. Sistemas electrónicos, señales y respuesta en frecuencia																
Tema 2. Amplificación, amplificadores y amplificadores operacionales																
Tema 3. Diodos, rectificadores y reguladores de tensión																
Tema 4. Sistemas digitales y sistemas combinacionales																
Tema 5. Sistemas basados en microcontroladores																

Nota. El cronograma se da por semanas de clase.

Fechas clave teoría

En Gris	Semana Santa
En Naranja	Intercuatrimestrales

PROGRAMA DE LABORATORIO	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S.S.	S14	S15
P1. Introducción al simulador Pspice																
P2. Introducción al laboratorio																
P3. Transductor I																
P4. Filtrado																
P5. Transductor II																
P6. Amplificación y detección																
P7. Op-Amp con alimentación simple										E1						
P8. Introducción al Microcontrolador																
P9. Proyecto Final																E2

Fechas clave laboratorio

En Gris	Festivos
En Naranja	Intercuatrimestrales
E1	Entrega de informe parcial (prácticas 1 a 6)
E2	Entrega de informe del proyecto final.