COMILLAS
UNIVERSIDAD PONTIFICIA
ICAI ICADE CIHS

Syllabus
2025 - 2026

TECHNICAL SHEET OF THE SUBJECT

Data of the subject	
Subject name	Electric and Electronic Circuits Laboratory
Subject code	DEA-SAP-235
Mainprogram	Intercambio de la Escuela Técnica Superior de Ingeniería (ICAI - SAPIENS)
Level	Intercambio
Quarter	Semestral
Credits	7,5 ECTS
Type	Optativa (Grado)
Department	Department of Electronics, Control and Communications
Coordinator	Esther de Juana López
Office hours	By appointment by e-mail: edejuana@comillas.edu. Email is the best way to contact me outside of class.

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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject

Contribution to the professional profile of the degree

This course is designed to give an introduction to electric circuits, semiconductor devices, and microelectronic circuits.

To provide knowledge about the concepts and techniques to analyze and design basic electronic circuits.

The laboratory approach in this course is project-based. You will be challenged:

- To design, build, test and optimize small circuits.
- Learn basic usage of LTSpice tool for simulation of electronic circuits.
- Measure circuit variables using equipment such as oscilloscopes, multimeters, power supplies and signal generators.
- Teamwork and make proper analysis of the results obtained which are main competencies for the technical profile of the engineer.

Prerequisites

A basic knowledge of introductory physics (charge, electric field, currents) and of Calculus is needed.

Competencies - Objectives

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks

1. Introduction: Charge, current, voltage, power, circuit elements, Ohm's law
2. Kirchhoff's current and voltage laws, voltage and current divisions

3. Node-voltage, mesh-current methods, superposition, and equivalence theorems
4. Operational Amplifier
5. RC and RL circuits, first-order network, step response
6. Sinusoidal excitation and phasors
7. AC steady-state analysis and AC steady-state power
8. Frequency response, passive filters
9. Semiconductor physics
10. Diodes, diode circuit analysis
11. MOS and BJT circuit analysis
12. Electronic circuit and digital information: introduction to logic circuits with diode and transistors

Theory

Theory sessions will be performed in a biweekly basis. Each session will include the presentation of the theoretical foundations of each topic, emphasizing the most important aspects, and the resolution of relevant problems. The content will cover the following blocks:

1. Introduction: Charge, current, voltage, power, circuit elements, Ohm's law
2. Kirchhoff's current and voltage laws, voltage and current divisions
3. Node-voltage, mesh-current methods, superposition, and equivalence theorems
4. Operational Amplifier
5. RC and RL circuits, first-order network, step response
6. Sinusoidal excitation and phasors
7. AC steady-state analysis and AC steady-state power
8. Frequency response, passive filters
9. Semiconductor physics
10. Diodes, diode circuit analysis
11. MOS and BJT circuit analysis
12. Electronic circuit and digital information: introduction to logic circuits with diode and transistors

laboratory

The laboratory approach in this course is project-based. Lab sessions will be performed weekly for two hours in the lab rooms in second floor of ICAI building. The sessions are oriented to improve the understanding of the theory, to develop the ability to design, assemble and verify the operation of electronic circuits and systems, and to correctly analyse the obtained measurements.
Teamwork, creativity and initiative are key aspects as well. The topics will be any of:

- Network Solving and Equivalent Circuits
- Transient Response
- MOSFET Inverter Circuits
- CMOS Logic Circuits
- CMOS Transient Analysis
- BJT Circuits
- Transistor-Transistor Logic
- Operational Amplifiers
- Nonlinear Op Amp Circuits
- Frequency Response

TEACHING METHODOLOGY

General methodological aspects of the subject

EVALUATION AND CRITERIA

Course policies

1. Attendance and Participation:

Theory classes: You can miss up to 5 classes without penalty. After that, you will not pass the course. If you are absent, you are responsible for any material covered. However, attendance isn't enough to make this course successful; I expect that you will also participate regularly in class by sharing your own ideas.

Lab sessions: You can miss up to 2 classes without penalty. After that, you will not pass the course.

2. Late assignments:

All section assignments are due at the beginning of section. No late assignments will be accepted.

3. Academic integrity:

Universidad P. Comillas does not tolerate academic dishonesty (i.e. cheating). If you are having problems with the course material, come to office hours or make an appointment to see me. Do not cheat.

In laboratory sessions and the final project, the total or partial copying of answers from other students —whether from the current course or from previous years— will be considered an academic irregularity.

The literal or paraphrased reproduction of content from other sources without proper citation will also be regarded as an attempt at plagiarism. This includes text generated by generative artificial intelligence models, which must comply with the guidelines outlined in the following section.

4. Rules for the Use of Generative Artificial Intelligence

Midterm Tests and Theory/Laboratory Exams

The use of generative artificial intelligence models or programming assistants is strictly prohibited during any form of assessment, whether in-person or remote. These activities must exclusively reflect the individual student's knowledge and work.

Laboratory Practices and Final Project

The use of programming assistants based on artificial intelligence and generative language models is permitted under the following conditions:

They may be used as a support tool to understand technical concepts, obtain suggestions on how to approach the proposed exercises, or initial drafts of reports.

The use of such tools must be complementary and must never replace the student's individual work. It is not permitted to submit automatically generated content as one's own without having properly understood, reviewed, and adapted it.

Any relevant content generated wholly or partially through these tools must be explicitly cited, clearly indicating which parts were produced using such tools and specifying which tool was used. The full sequence of prompts used must be included as an appendix at the end of the project report.

Instructors reserve the right to ask oral questions regarding content generated with AI assistance. Failure to explain or justify such content may negatively impact the activity's grade.

Responsible use of these tools is encouraged as support for individual study — for example, to clarify concepts, generate new exercises, or receive corrections. However, students are reminded that AI-generated responses may contain errors and should be critically evaluated.

Ratings

Ordinary evaluation period

The evaluation will be determined by the combination of the results of different activities:

- Two midterm exams.
- Weekly homework tasks.
- Two laboratory projects.
- Final exam.

Theory grade

It will be determined by two partial and final exams during the course. Weekly homework (graded) will be provided. The exams are all closed notebook and closed textbook. The grade will be given in the Spanish convention (0.0-10.0) with a 5.0 determining the boundary between Fail/Pass. The course will not be graded on a curve, i.e., there is no bound on the numbers of As, Bs, Cs, etc.

Laboratory

It will be evaluated with one practical test and a mandatory project (in groups of two or exceptionally three students; details will be given in the laboratory.

The final grade for the course

It will be weighted with the 3 quizzes, 2 lab projects and weekly homework assignments. Your final grade will be calculated according to the following weights:

1. Homework: 15%
2. Exam #1: 15%.
3. Exam #2: 15%.
4. Final exam. 20%.
5. Lab midterm design: 15%.
6. Lab final project: 20%.

In case one of the exams #1 or #2 are missed due to a justified cause, weights will be changed to:

1. Homework: 15%
2. Exam #1/Exam #2: 15%.
3. Final exam. 30%.
4. Lab midterm design: 15%.
5. Lab final project: 25%.

Note: *In order to apply the weights indicated for the ordinary evaluation period of the course, it will be necessary to obtain a minimum grade*

of at least 3 points in the final exam of the course. If EF<3 then: Grade = Min (0,15×E1+0,15*E2+0,2×EF; EF)

Extraordinary evaluation period/retake

The student who fails the subject but has passed the laboratory part can retake the theory exam in the extraordinary evaluation period.

In this case, the final grade will be calculated as the mark of the retake exam (60%) and the laboratory and homework (40%):

1. Retake Exam: 60%.
2. Lab midterm design: 12%.
3. Lab final project: 16%.
4. Homework:. 12%.

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography

Essentials of Electrical and Computer Engineering by D. V. Kerns, Jr. and J. D. Irwin, Prentice-Hall, 2004.

Or (you can find it much cheaper used):

Fundamentals of Electronic Circuit Design by D. Comer and D. Comer, Wiley, 2002.

But basically, any good introductory book to electronics will do. The teacher will provide summary sheets and exercises during the course.