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.

Teacher Information

Teacher

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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.

Ratings

Ordinary evaluation period:

The theory grade will be determined by three partial exams during the course.

Weekly homework (graded) will be provided.

The exams are closed notebook, closed textbook and simple calculator. The course will not be graded on a curve, i.e., there is no bound on the numbers of A's, B's, C's etc.

The laboratory 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 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:
a) Homework: 15%
b) Exam #1: 15%.
c) Exam #2: 15%.
d) Final exam. 20%.
e) Lab midterm design: 15%.
f) 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:

a) Homework: 15%
b) Exam #1/Exam #2: 15%.
d) Final exam. 30%.
e) Lab midterm design: 15%.
f) Lab final project: 25%.

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%).

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.