Electricity and Electronics

Code: 107887
ECTS Credits: 6

2025/2026

Degree	Type	Year
Computer Engineering	FB	1

Contact

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

The student must be able to use the following mathematical concepts:

- Trigonometric, logarithmic, exponential functions
- Representation of functions
- Derivation and integration of functions
- Complex numbers

Objectives and Contextualisation

- Understand the basic concepts of electricity and electronics, and know the basic elements of electronic circuits.

- Know how to use the laws of circuit analysis to determine the behavior of linear electric circuits.

- Know how to analyze the temporary behavior of circuits with elements that store energy.

- Know how to analyze the frequency response of electrical circuits powered with sinusoidal signals.

- Know the physical basis of electronic devices based on semiconductors.

- Know the operation principle of field effect transistors and their basic digital applications.

Learning Outcomes

1. KM04 (Knowledge) Define the basic concepts of electrical circuit theory and electronic circuits.
2. KM05 (Knowledge) Identify the basic designs to implement logic gates and memory cells for processing and storing digital information.
3. SM06 (Skill) Apply knowledge of electrical and electronic circuits to solve general computer engineering problems.
4. SM07 (Skill) Analyse theoretically first-order electrical circuits in continuous operation, both transient and permanent, with the help of computer-aided simulation.

Content

1 - Introduction to electronic circuits. Introduction to the subject. Basic concepts of field, electromagnetism and electricity. Basic elements: voltage and current sources, resistors, capacitors and coils. Power and energy.

2 - Basic laws of circuit analysis. Linear circuits. Resolution of simple circuits with Kirchhoff laws. Other methods: superposition principle, Thevenin and Norton theorems.

3 - Temporary evolution: Transient regime. First order circuits and resolution techniques. First order basic circuits: resolution of simple circuits, such as the RC and RL circuits, among others. Determination of the initial conditions and steady state of a circuit before and after a transient stage.

4 - Permanent sinusoidal regime. Introduction to the permanent regime. Definition of the sinusoidal signal. Introduction to complex notation and definition of the concept of impedance. Determination of the transfer function of a circuit. Study of the frequency response of a circuit: Bode diagram. First order filters.

5 - Introduction to Semiconductors and PN junction díodes.

6 - Logic gates with MOSFET field effect transistors. Structure and types of transistors. I-V curves and operating regions. Digital applications. Memories and logic gates.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Lab sessions	12	0.48	KM04, KM05, SM06, SM07, KM04
practical session in the classroom	12	0.48	KM04, KM05, SM06, KM04
Theoretical lessons	26	1.04	KM04, KM05, SM06, KM04
Type: Supervised			
Previous report of lab sessions	12	0.48	KM04, KM05, SM06, SM07, KM04
Problems resolution under the lecturer supervision	3	0.12	KM04, KM05, SM06, KM04

Type: Autonomous			
Individual study	35	1.4	KM04, KM05, SM06, SM07, KM04
Resolution of problems (individual or small groups)	20	0.8	KM04, KM05, SM06, SM07, KM04
Searching of information	8	0.32	KM04, KM05, SM06, KM04

During the semester, theoretical and practical classes will be carried out in the classroom. In theoretical classes, we will expose the scientific-technical knowledge of the subject in a structured way. The basic concepts will be shown to the student with instructions on how to complete these contents. In the practical classes in the classroom, in small groups, students must solve problems related to the contents exposed in the lectures, with the support of the professor. The objective is to complete the understanding of the contents of the subject. There will be one or several individual and / or group activities that will be scored for the final assessment of the student.

Several laboratory sessions, of mandatory realization, will be planned. The planning will be published in the CV at the beginning of the academic course. The objective is to promote the student's active learning by working on the implementation and measurement of basic electronic circuits, as well as developing critical reasoning skills and teamwork.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Activities carried out in supervised sessions	25	4	0.16	KM04, KM05, SM06
Evaluation of work carried out and presented by the student	30	12	0.48	KM04, KM05, SM06, SM07
theoretical-practical test	45	6	0.24	KM04, KM05, SM06

Individual theoretical-practical tests:

- For the assessment, two individual partial tests carried out in the classroom with a weight of 45% on the final grade will be taken into account. A minimum grade of 3 will be required in the second test and an average of 5 between the two tests is necessary to overcome this part.

Activities carried out in supervised sessions:

- The resolution of problems in groups assisted by the professor in the classroom will be taken into account for the Student assessment with a weight of 25%.

Evaluation of work carried out and presented by the student:

- In the laboratory sessions (which are mandatory), the student must complete in group a questionnaire that will be evaluated by the professor, except in simulation sessions with SPICE. In this case, the report must be

delivered at the beginning of the next session.The grade corresponding to the laboratory sessions (which are not recoverable) has a weight of 30% on the final grade, and a minimum score of 5 is required so that they can be considered for the evaluation of the student. In the case of repeaters who have passed the laboratory sessions in the three previous academic courses, it will not be necessary to do them again during this academic year and they will keep the grade obtained in the course that passed them.

- In case of having reached the minimum grade of each section, the final grade of the subject will be obtained by weighting the grades with their corresponding weight. If the minimum grade is not reached in the individual theoretical-practical tests or a minimum of 5 in the final grade of the course, the student will have a second chance (as long as they have completed and passed the laboratory sessions) by taking a final exam of all the contents of the subject with a weight of 70% (this exam will include the corresponding evaluation of the individual theoretical-practical tests as well as the activities carried out in supervised sessions). A mínimum score of 5 will be required in the final exam grade to average with the rest of the obtained grades.

- In case that the minimum grade set for each of these sections has not been reached, the student won't pass the subject. The final grade will correspond to the individual theoretical-practical tests if it is less than 5. If it exceeds 5, the final grade of the subject will be 4.5.

- This subject does not allow the single assessment system.

- For the assessment activities, a place, date and time of review will be indicated allowing students to review the activity with the lecturer. In this context, students may discuss the activity grade awarded by the lecturers responsible for the subject. If students do not take part in this review, no further opportunity will be made available.

- In order to pass the course with honours, the final grade must be a 9 or higher. Because the number of students with this distinction cannot exceed 5% of the number of students enrolled in the course, this distinction will be awarded according to the lecturers of the subject.

- A "non-assessable" grade will be assigned only to students who have not carried out any of the individual theoretical-practical partial tests and the final exam.

- Continuous-assessment dates will be published on Campus Virtual and may change when necessary. Any such modification will always be communicated to students through Campus Virtual, which is the usual communicationplatform between lecturers and students.

- Notwithstanding other disciplinary measures deemedappropriate, and in accordance with the acadèmic regulations in force, assessment activities will receive a zero whenever a student commits acadèmic irregularities that may alter such assessment. Assessment activities graded in this way and by this procedure will not be re-assessable. If passing the assessment activity or activities in question is required to passthe subject, the awarding of a zerofor disciplinary measures will also entail a direct fail for the subject, with no opportunity to re-assess this in the same academic year. Irregularities contemplated in this procedure include, among others:

- the total or partial copy of a practical exercise, report, or any other evaluation activity;

- allowing others to copy;

- presenting group work that has not been done entirely by the members of the group;

- presenting any materials prepared by a third party as one's own work, even if these materials are translations or adaptations, including work that is not original or exclusively that of the student;

- having communication devices (such as mobile phones, smart watches, etc.) accessible during theoretical-practical assessment tests (individual exams)

- talking to classmates during individual theoretical and practical assessment tests (exams)

- copying or attempting to copy from other students during theoretical and practical assessment tests (exams)

- using or attempting to use writings related to the subject during the theoretical and practical assessment tests (exams) when they are not explicitly permitted.

In future editions of this subject, the student who has committed irregularities in an assessment activity, any of the assessment activities carried out will not be validated.

In summary: copy, allowing other to copy or plagiarize (or attempt) in any of the assessment activities is equivalent to a fail for the subject, not compensable and without validation of parts of the subject in subseqüent courses.

In case of failing the subject due to having committed any of these irregularities in an assessment activity, the final grade will be thelower value between 3.0 and the average of the individual theoretical-practicaltests (and therefore it willnot be possible to pass the subject by compensation).

In this subject, the use of Artificial Intelligence (AI) technologies is not allowed in any of its phases. Any work that includes fragments generated with AI will be considered a lack of academic honesty and may lead to a partial or total penalty in the grade of the activity, or greater sanctions in serious cases.

To attend any exam it will be necessary to identify yourself with DNI.

Bibliography

Bibliography:
A.P. Malvino, Principios de Electrónica, McGraw-Hill, 2007
A.B. Carlson, Teoria de circuitos, Thomson 2002
R.L. Boylestad, Introducción al análisis de circuitos, Pearson Education,
J.Millman. Microelectrònica. Circuits i sistemes analògics i digitals. Hispano europea. 1991
L. Prat i altres, Circuitos y dispositivos electrónicos. Fundamentos de Electrónica. Edicions UPC. 1999

OTHERS:
C.A. Holt, Circuitos electrónicos digitales y analógicos. Reverté, 1985.
A.R. Hambley, Electrónica, Prentice Hall.
M.H. Rashid, Circuitos microelectrónicos, Thomson, 2002
R.E. Thomas i A.J. Rosa, Circuitos y señales, Reverté.

Software

In some laboratory sessions PSPICE and KiCad will be used.

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	411	Catalan/Spanish	second semester	morning-mixed
(PAUL) Classroom practices	412	Catalan/Spanish	second semester	morning-mixed
(PAUL) Classroom practices	431	Catalan/Spanish	second semester	morning-mixed

(PAUL) Classroom practices	432	Catalan/Spanish	second semester	morning-mixed
(PAUL) Classroom practices	451	Catalan/Spanish	second semester	afternoon
(PAUL) Classroom practices	452	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	411	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	412	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	413	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	414	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	415	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	416	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	417	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	418	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	419	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	420	Catalan/Spanish	second semester	afternoon
(PLAB) Practical laboratories	421	Catalan/Spanish	second semester	morning-mixed
(TE) Theory	41	Catalan/Spanish	second semester	morning-mixed
(TE) Theory	43	Catalan/Spanish	second semester	morning-mixed
(TE) Theory	45	Catalan/Spanish	second semester	afternoon