UAB
Universitat Autònoma de Barcelona

Circuit Theory and Electronics

Code: 102709
ECTS Credits: 9

2025/2026

Degree	Type	Year
Electronic Engineering for Telecommunications	FB	1
Telecommunication Systems 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

There are no prerequisites

Objectives and Contextualisation

The subject aims to familiarize students with the theory, techniques and basic devices used in the analysis of ele

Learning Outcomes

1. KM09 (Knowledge) Define the basic concepts of electrical circuit theory, electronic circuits.
2. KM09 (Knowledge) Define the basic concepts of electrical circuit theory, electronic circuits.
3. KM11 (Knowledge) List the different energy sources and the basics of power electronics.

4. KM11 (Knowledge) List the different energy sources and the basics of power electronics.
5. SM08 (Skill) Analyse theoretically and with the help of computer-aided simulation first and second order electrical circuits in continuous operation, in transitory regimes, and in permanent regimes.
6. SM08 (Skill) Theoretically analyse continuous, transient and steady-state first- and second-order electrical circuits with the help of computer-aided simulation.

Content

Theory Syllabus

Topic 1. Elements, Variables, and Equations of Electrical Circuits
1.1. Electrical or Electronic Circuit: Introduction
1.2. Electrical Variables of a Circuit: Fundamental and Derived Variables
1.3. Circuit Elements and Sign Criteria
1.4. Resistors and Voltage and Current Sources
1.5. Power Dissipated and Supplied by an Element
1.6. Kirchhoff's Laws: KCL and KVL
1.7. Dependent Sources. Kirchhoff's Laws with Dependent Sources
1.8. Equivalent Circuits: Series and Parallel Associations, Source Transf
Topic 2. Basic Laws and Methods for Solving Resistive Circuits
2.1 Generating Variables and the Knot Method
2.2 Some Theorems of Circuit Theory
2.2.1 Superposition
2.2.2 Thevenin's and Norton's Theorems
Topic 3. Circuits in Transient Time Regime: First-Order Dynamic Circuits
3.1 Capacitors and Inductors: Definition, Properties
3.2 Capacitors and Inductors in Series and Parallel
3.3 Equation of a First-Order Dynamic Circuit
3.4 Analytical Solutions for
3.4.1 Constant Excitation
3.4.2 Constant Piecewise Excitation

Topic 4. Sinusoidal Steady-State Mode
4.1 Introduction and Sinusoidal Steady-State Circuits
4.2 Phasors
4.3 Phasor Formulation of Circuit Equations
4.3 Impedance and Admittance
4.4 Sinusoidal Steady-State Power and Definition of Power Factor
Topic 5. Introduction to Semiconductor and Device Physics
5.1 PN Junction Diode
5.2 Simple DC Models of PN Diodes and Polarization. Load Line
5.3 Diode CircuitsTopic 6. Operational Amplifier
6.1 Introduction
6.2 Linear and Nonlinear Modes of Operation
6.3 Linear Applications:
6.3.1 Non-inverting Amplifier
6.3.2 Voltage Follower (Buffer)

6.3.3 Inverting Amplifier
6.3.4 Adder
6.3.5 Integrator
6.3.6 Differentiator
6.4 Nonlinear Applications: Comparators
Topic 7. Two-Gate Circuits. Matrix Representation of Circuits
Lab Practices

Practice 1: PSPICE 1

Practice 2: PSPICE 2

Practice 3: Electronic Laboratory Instruments

Practice 4: Basic Passive Components

Practice 5: Basic Circuits and Passive Components: Transient and Steady-State Behavior

Practice 6: Bode Diagram of RC Circuits

Practice 7: Basic Active Components: The Diode. Basic Circuits

Practice 8: The Operational Amplifier. Basic Circuits

Practice 9: Individual Practice Exam

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
problem classes	24	0.96	SM08, SM08
theori sesions	48	1.92	KM09, KM09, KM11, SM08
Type: Supervised			
Lab Sessions	28	1.12	KM09, KM09, KM11, SM08
Type: Autonomous			
Study and lab session Preparation Hours	94	3.76	KM09, KM09, KM11, SM08

The theoretical concepts necessary for the rest of the course activities will be presented in the lecture sessions. T
Problem-solving classes are designed to put into practice the theoretical
During the practical sessions, students come into contact with electronic
Note: 15 minutes of a class will be reserved within the schedule establish

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
Lab exam	50% of the lab grade	2	0.08	SM08
Practice questionnaires completed during the practice session	70% of the grade for each practical session	4	0.16	KM09, KM11, SM08
Previous lab session reports	30% of the grade for each practical session	18	0.72	KM09, SM08
Synthesis exam (recovery process)	Up to 100% of the theory grade (70% of the subject grade)	3	0.12	KM09, KM11, SM08
two partial exams	Each partial exam corresponds to 35% of the final grade for the subject.	4	0.16	KM09, KM11, SM08

This course does not allow single evaluation.

The evaluation of the subject will be carried out through three clearly differentiated types of activities: practicals, two midterm exams, and a synthesis exam.

Practicals.

The practical part consists of eight mandatory practicals and a final exam. The laboratory practicals will be evaluated with a preliminary report and a practical report. The preliminary report is worth 30% of the grade for each practical, and the practical report is worth 70%.

All practicals must be completed.

Up to 2 practicals may be done outside their scheduled time, provided that the absence from the practical is justified. In this case, the grade for these two practicals will be replaced by the grade resulting from the evaluation of specific tasks and/or activities proposed by the teaching staff.

Unjustified absence from any of the scheduled practicals will result in failing the practicals (and consequently the subject).

At the end of the 5 practicals, a practical exam will be held, which will be graded with a score representing 50% of the final practical grade, if the score obtained is higher than 5. Otherwise, the practical grade will be the score obtained in the practical exam.

Midterm Exams.

Two midterm exams will be held, each covering approximately half of the subject's syllabus (part A and B, respectively).

These exams will last 2 hours. They will result in the midterm grades NPA and NPB, ranging from 0 to 10 points.

Final Synthesis Exam.

It will be held at the end of the semester.

To participate in the synthesis test (make-up exam), it is necessary to have passed the practicals and have an average score higher than 2 out of 10 in the two midterm exams.

It will consist of two parts corresponding to the material included in parts A and B.

The part ofthe exam that is failed (NPA and/or NPB <5) must be taken. Students who have passed both parts do notneed to take the exam unless they want to improve their grade. In these cases, students waive their previous grades and will use the grade obtained in the exam to determine the final grade for the subject.

To pass the synthesis exam, an overall average score of 5 is required.

After grading this final exam, all students will have a score between 0 and 10 in parts A and B, either obtained in the midterms, in this exam, or a combination of the two tests.

Mobile Phones and Electronic Devices.

During the written tests, mobile phones and electronic devices must be turned off and placed on the table. Violation of this rule will result in failing the test.

Final Grade for the Subject.

The final grade for the subject is calculated as the weighted average of the midterm or final exam grades and practicals, where practicals count for 30% and the exam part for 70%. To average with the practical grade, the synthesis exam grade must be 5 or higher.

Without prejudice to other disciplinary measures deemed appropriate, and in accordance with current academic regulations, irregularities committed by a student that may lead to a variation in the grade will be graded with a zero (0). For example, plagiarizing, copying, allowing copying, etc., an evaluation activity will result in failing that evaluation activity with a zero (0). Evaluation activities graded in this way and by this procedure will not be recoverable. If it is necessary to pass any of these evaluation activities to pass the subject, the subject will be directly failed, without the opportunity to recover it in the same course.

Special Grades

Only if no practical reports or home assignments are submitted, the grade will be Not Evaluable. Otherwise, the final grade will be calculated based on the weights of each evaluation activity. If the practicals are failed, the final grade will be calculated based on the weighting of each activity and, ifit exceeds 5, it will be recorded as a 4.

For each subject in the same study plan, Honors can be awarded globally, resulting from calculating five percent or a fraction of the students enrolled in all teaching groups of the subject. It will only be awarded to students who have obtained a final grade of 9.00 or higher, and always at the discretion of the teaching staff (based on the student's excellence).

Revisions: The regular review of the assessment activities will begin at least twenty-four hours after the grades have been published, or on the same day if this has been publicly announced in advance.

Use of AI In this course, the use of Artificial Intelligence (AI) technologies is not permitted at any stage. Any work containing AI-generated content will be considered a breach of academic integrity and may result in a partial or total penalty in the activity's grade, or more serious sanctions in severe cases.

Bibliography

Main Books

- R. Boylestad y L. Nashelsky. "Introducción al análisis de Circuitos", Prentice Hall
- R. Boylestad y L. Nashelsky. "Teoría de Circuitos y dispositivos electrónicos", Prentice Hall.

Other books:

- A.Bruce Carlson. Teoría de circuitos. Thomson-Paraninfo. 2002. (IBSB: 84-9732-066-2)
- J. David Irwin. Análisis básico de circuitos en Ingeniería. Prentice Hall Hispanoamericana.1997. (ISBN:968-880-816)
- Allan R. Hambley, "Electrónica", Segunda Edición, Prentice Hall, 2001
- C. J. Savant Jr., Martin S. Roden, Gordon L. Carpenter, "Diseño Electrónico, Circuitos y sistemas", Tercera Edición, Prentice Hall, 2000.
- Norbert R. Malik, "Circuitos Electrónicos, Análisis, simulación y diseño", Prentice may, 2000.

Software

Software

Pspice 9.1 student edition

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	311	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	312	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	331	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	332	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	351	Catalan/Spanish	first semester	afternoon
(PAUL) Classroom practices	352	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	311	Catalan	first semester	morning-mixed

(PLAB) Practical laboratories	312	English	first semester	morning-mixed
(PLAB) Practical laboratories	313	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	314	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	315	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	316	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	317	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	318	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	319	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	320	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	321	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	322	Catalan/Spanish	first semester	morning-mixed
(TE) Theory	31	Catalan	first semester	morning-mixed
(TE) Theory	33	Spanish	first semester	morning-mixed
(TE) Theory	51	Catalan	first semester	afternoon