Course guide
340035 - SIEK-N - Electronic Systems

Last modified: 16/07/2026

Unit in charge: Vilanova i la Geltrú School of Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN ELECTRICAL ENGINEERING AND RAILWAY SYSTEMS (Syllabus 2024). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish, English

LECTURER

Coordinating lecturer: Varela Barreras, Jorge

Others: Varela Barreras, Jorge
Zapater Villar, Sergi

PRIOR SKILLS

Autonomous learning and taking initiative in problem solvings are necessary skills in this course

REQUIREMENTS

Students registering in this subject are expected to have the subjects "Equacions Diferencials", "Calcul Avançat" and "Sistemes Elèctrics" from previous semesters passed

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. CE11. Knowledge of electronical fundamentals.
9. CE32. Ability to analize electrical circuits in all possible regimes.

TEACHING METHODOLOGY

Basic and theoretical concepts of electronics are provided by means of class lectures and by means of examples in the form of exercises. As for the lab, students will consolidate the main technical concepts by prototyping electronic circuits.

Additionally, innovative teaching technologies are integrated, such as cooperative learning (moderated debates and group dynamics), flipped classroom, and the guided use of Artificial Intelligence tools (such as code assistants and Socratic tutors).

LEARNING OBJECTIVES OF THE SUBJECT

The aim of this subject is to provide the fundamental knowledge and to show the basics of industrial electronics. It will describe the most important technologies of electronic devices and systems available and it will explain the basic methodologies to analyze electronic systems.

STUDY LOAD

Type	Hours	Percentage
Hours large group	45,0	30.00
Hours small group	15,0	10.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

- Module 1 - Introduction. Resistive circuit analysis

Description:
The electronic system, introduction
History of electronics
Basic concepts, Kirchoff laws
Thevenin and Norton equivalents
Systematic analysis, mesh currents
Systematic analysis, node voltages

Specific objectives:
To understand the history of electronics, and to learn and apply the basic electrical laws and rules that allow for the study of the behavior of electronic systems.

Related activities:
- Class sessions include examples in the form of exercises
- Lab activities (6 sessions)
- Self study (35 hores)
- Evaluation sessions (80 min)

Full-or-part-time: 73h
Theory classes: 22h
Laboratory classes: 8h
Guided activities: 2h
Self study : 41h

Module 2 – Passive systems analysis with RLC

Description:
Solving using differential equations
System in Laplace domain
Solving using Laplace domain
Transfer function
Bode diagrams

Specific objectives:
Know and use the basic mathematical tools to solve circuits with memory elements

Related activities:
- Class sessions include examples in the form of exercises
- Lab activities (3 sessions)
- Self study (30 hores)
- Evaluation Sessions (70 min)

Full-or-part-time: 58h
Theory classes: 14h
Laboratory classes: 6h
Guided activities: 2h
Self study : 36h

Module 3 – Circuits with semiconductor elements

Description:
P-N union, circuits with diodes, rectifiers
Zener diode, regulation and limiting voltage circuits
LED diode, photo-diode and opto-coupler
The transistor, amplifiers, commutation circuits and voltage regulators
The operational amplifier, comparers, active filters
Introduction to the digital world, microcontrollers

Specific objectives:
Know and analyze circuits with the basic electronic components electronic : diodes, transistors and operational amplifiers

Related activities:
- Class sessions include examples in the form of exercises
- Lab activities (3 sessions)
- Self studyl (24 hores)
- Evaluation sessions (60 min)

Full-or-part-time: 19h
Theory classes: 6h
Guided activities: 1h
Self study : 12h

ACTIVITIES

LAB - Lab Activities

Full-or-part-time: 18h
Guided activities: 12h
Self study: 6h

NP1 - First Midterm Exam

Full-or-part-time: 56h
Theory classes: 18h
Guided activities: 2h
Self study: 36h

NP2 - 2nd Midterm Exam

Full-or-part-time: 47h 50m
Theory classes: 14h 20m
Guided activities: 1h 30m
Self study: 32h

GRADING SYSTEM

• The knowledge acquired by the student is assessed through written and laboratory tests, which account for 80% and 20% of the final grade, respectively.

• The theoretical part consists of two written tests: one held mid-term (Nex1 40% of the grade) and another at the end of the course (Nex2 40% of the grade).

• The Nex2 exam will include a section to re-assess Nex1.

• If the final grade of the course is greater than or equal to 2 and less than 5, the theoretical part can be re-assessed. In this case, the final grade will have a maximum value of 7.

• Additionally, provided that the final grade of the course is higher than 4.5, up to 1 extra point can be added to the final grade through active participation in the voluntary activities proposed in class (such as cooperative learning dynamics, flipped classroom, self-assessment tests, or guided use of AI).

• Passing the course requires a final grade equal to or higher than 4.9.

EXAMINATION RULES.

• Mandatory in-person attendance to the laboratory: Laboratory sessions are in-person. Students must attend a minimum of 80% of the sessions (meaning at least 5 out of the 6 scheduled sessions) to be eligible for evaluation in this part.

• Grade retention: In the event of failing the course, the grade obtained in the laboratory, as well as the Class Activities Grade (NAC) earned, will be saved for the last 4 academic years.

BIBLIOGRAPHY

Basic:

- Thomas, Roland E; Rosa, Albert J. Circuitos y señales : introducción a los circuitos lineales y de acoplamiento. Barcelona [etc.]: Reverté, 1991. ISBN 8429134581.
- Madhu, Swaminathan; Unnikrishnan, R. Linear circuit analysis. Englewood Cliffs, N.J: Prentice-Hall, 1988. ISBN 0135367158.
- Sedra, Adel S; Smith, Kenneth C. Microelectronic circuits. 7th ed. New York: Oxford University Press, 2016. ISBN 9780199339143.
- Floyd, Thomas L. Principios de circuitos eléctricos. 8a ed. México: Pearson, 2007. ISBN 9789702609674.
- Floyd, Thomas L. ; Buchla, David M. Principles of electric circuits : conventional current. 10th ed. Harlow, Essex: Pearson, 2022. ISBN 9781292025667.
- Franco, Sergio. Design with operational amplifiers and analog integrated circuits. 4th ed. Boston [etc.]: McGraw-Hill, 2015. ISBN 9781259253133.