UAB
Universitat Autònoma de Barcelona

# Electronic Instrumentation

Code: 106833
ECTS Credits: 6

**2025/2026**

| Degree | Type | Year |
|---|---|---|
| Nanoscience and Nanotechnology | OB | 2 |

## Contact

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## Teaching groups languages

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

## Prerequisites

It is recommended to have passed the subjects of the first course of Mathematics and General Physics: Electricity and Magnetism, as well as simultaneously taking the subject Eines Matemàtiques of the second year

## Objectives and Contextualisation

The main objective is to provide the basic concepts, with special emphasis on the practical aspects, for the implementation of electronic instrumentation systems for the conditioning and processing of electrical signals. This includes the ability to be autonomous in the handling of the main electronic instrumentation equipment, in the assembly of amplifiers and basic filters as well as in the simulation of the behavior of electronic circuits

## Learning Outcomes

1. CM27 (Competence) Work in teams to develop practical cases in the field of nanotechnology and assess their social, economic and environmental impact.
2. KM45 (Knowledge) Recognise the fundamentals of electrical signal processing: amplification, filtering and analogue-to-digital and digital-to-analogue conversion.
3. SM38 (Skill) Determine the physical and chemical characteristics of microsystems using electronic and control instrumentation.
4. SM40 (Skill) Use digital tools and documentary sources to obtain, analyse and present information from a critical perspective in the field of nanotechnology.

## Content

1. Circuits Theory. Elements, variables and equations of electrical circuits. Theorems of circuit theory. Properties, characteristics and dynamic behavior of circuits with passive electrical components.

2. Basic instruments for electrical measures. Osciloscope. Multimeters. Power supplies and waveform generators. Passive and active probes.

3. Circuits and systems for signal processing. Amplification, Filtering and analog-digital and digital-analog converters.

4. Automation of measurement equipment. Main features and limitations. Adquisition Cards. Virtual instrumentation: hardware and software

## Activities and Methodology

| Title | Hours | ECTS | Learning Outcomes |
|---|---|---|---|
| Type: Directed | | | |
| Exercises classes | 10 | 0.4 | |
| Laboratory | 30 | 1.2 | |
| Theoretical expositions | 15 | 0.6 | |
| Type: Supervised | | | |
| Case studies | 10 | 0.4 | |
| Mentoring | 15 | 0.6 | |
| Type: Autonomous | | | |
| Reading, resolution and writing of the laboratory reports | 30 | 1.2 | |
| Study for the assimilation of concepts | 30 | 1.2 | |

Theoretical classes Explanation by the teacher of the fundamental concepts of each of the topics. Part of the concepts will be introduced as a resolution of specific cases.

Problem classes Resolution and discussion by the teacher from the exercises and problems given to students.

Laboratory: Completion of practices in the electronic laboratory. Part of the practices will require a previous resolution based on mathematical calculations or by using an electric simulation tool. The last two practical sessions will include designs proposed by students to solve a practical case that will be considered during the course.

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

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## Assessment

## Continous Assessment Activities

| Title | Weighting | Hours | ECTS | Learning Outcomes |
|---|---|---|---|---|
| Case study problems delivery | 15% | 2 | 0.08 | SM40 |
| Laboratory Assessment | 40% | 2 | 0.08 | CM27, SM40 |
| Written exams | 45% | 6 | 0.24 | KM45, SM38 |

The evaluation of the subject will have 3 differentiated sections:

a) There will be compulsory two written exams of the concepts given in the classes of theory and problems. At the end of the course there will be a final final exam so that students can pass or improve their qualification. The weight of this written exam is 45%. A minimum score of 4.5 is required in this section to do the final weighting. Students are only allowed to attend this final exam if they have attended the two partial examinations. If a student does not attend one of the partial examinations, it will be considered "non-evaluable".

b) In each problem session, a problem will be raised that students will have to solve at the following session. These delivered problems will have a weight of 15% to the final grade. This is an activity that is not recoverable.

c) Practices, which are compulsory and not recoverable, will have a final weight of 40%. The evaluation of the same will be done with 2 grades:

· Written document with the experimental results of the practices, evaluating in particular the interpretation and discussion of the results compared with the theoretically expected and / or previously simulated, 90%;

· Active participation in the laboratory sessions (with the possibility of an oral examination for an individual assessment of the students), 10%.

To obtain a qualification of Matrícula d'Honor (which is possible to qualify the 5% of the enrolled students), grades above 9 to all the above items are needed and with a final average of 9.3

Single assessment:

The students who have joined the single assessment modality will have to carry out a final test that will consist of an exam of all the theoretical topics and problems of the subject. The students should also to delivery the reports of all the laboratory practices carried out.

This test is carried out on the day in which the students of the continuous assessment take the second partial exam. The qualification of the student will be:
Course grade = (Final test grade 60% + Laboratory grade 40%)/100
If the final grade does not reach 5, the student will have another opportunity to pass the subject by taking the recovery exam that will be held on the date set by the coordination of the degree. In this test you will be able to recover 60% of the note corresponding to the part of theory and problems. The laboratory part is not recoverable."

## Bibliography

R. Boylestad y L. Nashelsky. "Introducción al análisis de Circuitos", Pearson, 2017. Versió on-line. Correspon al temari del primer parcial.

R. Boylestad y L. Nashelsky. "Electrónica: Teoría de Circuitos y dispositivos electrónicos", Pearson, 2018. Versió on-line. Correspon al temari del segon parcial.

B.H. Vassos and G.W. Ewing, "Analog and computer electronics for scientists", John Wiley & Sons (1993)

D. Wobschall, "Circuit design for electronic instrumentation", McGraw-Hill (1987)

P. Horowitz and W. Hill,The Art of Electronics,Cambridge Univ. Press (1989)

J.Y. Beyon, "LabVIEW Programming, data adquisition and analysis", Prentice Hall (2001)

A.Bruce Carlson. Teoría de circuitos. Thomson-Paraninfo. 2002. (IBSB: 84-9732-066-2)

R. Pallás-Areny, "Instrumentos electrónicos básicos", Ed. Marcombo, 2006.

J.C. Alvarez et al., "Instrumentación electrónica", Thomson-Paraninfo, 2006

J.David Irwin. Análisis básico de circuitos en ingeniería , Limusa Wiley, cop. 2003 6ª ed.

Dorf, Richard C. Introduction to electric circuits Hoboken, N.J. : Wiley, cop. 2011 8th ed., International student ed.

Thomas L. Floyd. Principios de circuitos eléctricos / Pearson, 2007, 8ª ed.

## Software

-Pspice de Orcad (student version)

-Labview

## 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 | 1 | Catalan | second semester | afternoon |
| (PAUL) Classroom practices | 2 | Catalan | second semester | afternoon |
| (PLAB) Practical laboratories | 1 | Catalan | second semester | morning-mixed |
| (PLAB) Practical laboratories | 2 | Catalan | second semester | morning-mixed |
| (PLAB) Practical laboratories | 3 | Catalan | second semester | morning-mixed |
| (TE) Theory | 1 | Catalan | second semester | afternoon |