

## Basic Electronics

Code: 106926  
ECTS Credits: 6

**2025/2026**

Degree	Type	Year
Management of Smart and Sustainable Cities	FB	1

## Contact

Name: Rosana Rodriguez Martinez

Email: [rosana.rodriguez@uab.cat](mailto:rosana.rodriguez@uab.cat)

## Teachers

Rosana Rodriguez Martinez

## Teaching groups languages

You can view this information at the [end](#) of this document.

## Prerequisites

Although there are no mandatory academic prerequisites to follow the course, it is recommended that the student has interest to acquire technological knowledge, in order to deepen and innovate in the actual society.

## Objectives and Contextualisation

The course will allow the student to acquire the main concepts in electronics, needed to understand the processes to manage smart cities, from the point of view of the information and communication technologies.

## Learning Outcomes

1. CM03 (Competence) Relate the knowledge and skills of the subject with those provided by other technicians in interdisciplinary teams.
2. KM04 (Knowledge) Interpret technical documents and specification sheets of electronic components.
3. KM05 (Knowledge) Describe mathematical models of electronic systems and flows of electricity and matter.
4. KM06 (Knowledge) Describe energy storage, generation and distribution systems, as well as the technologies, tools and techniques of environmental engineering.
5. SM05 (Skill) Develop material and energy balances in steady and dynamic states.

## **Content**

### Unit 1. Elements, variables and equations of the electronic circuits

Introduction to electronic circuits

General concepts: electric charge, electric field, electric potential, electric current

Electric variables of a circuit: fundamental and derived variables

Passive elements of a circuit: resistance, capacitor and inductance

Association of passive elements: series and parallel association

Active elements of a circuit: Voltage and current sources

Energy and power in the circuit elements

### Unit 2. Electric signals

Periodic signals: frequency, period and phase

Values associated to periodic signals: peak value, average value and effective value

### Unit 3. Circuit resolution

Node, branch and mesh definitions

Kirchhoff's laws: KCL i KVL

Circuits resolution by the nodes method

Superposition theorem

Thévenin and Norton theorems

### Unit 4. Basic electronic instrumentation: Basic measurement and signal generation equipment

Signal generator

Oscilloscope

Multimeter

Spectrum analyzer

### Unit 5. Circuits in temporal transient regime

1<sup>st</sup> order circuits

Analytical solutions by constant excitation and constant excitation in time intervals

### Unit 6. Sinusoidal stationary regime

Sinusoidal stationary regime

Introduction to phasors

Phasor formulation of circuit equations

Study of the frequency response of a circuit: Bode diagram

## Unit 7. Microelectronics fundamentals

Precedents and birth of modern electronics. Semiconductor electronic devices: diode and transistors. Integrated circuits. Photovoltaic cells

## Unit 8. Generation, transport and electrical energy storage

Generation and distribution of electrical energy

Electrical energy storage technologies. Ragone plots

Basic concepts of electromagnetic waves propagation. Electromagnetic spectrum. Wireless power transmission

## Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
In person sessions	26	1.04	
Laboratory sessions	6	0.24	
Problems resolution out of classroom	36	1.44	
Type: Supervised			
Problems resolution sessions in the classroom	18	0.72	
Type: Autonomous			
Individual study	34	1.36	

The educational methodology will combine the autonomous work with supervised and guided activities. In the supervised and guided activities we will combine master classes, problems seminars and laboratory sessions.

In order to perform a correct evaluation of the transversal competences, the students will carry out the laboratory sessions in groups. This activity will allow them to develop the transversal competences related with group work, so that they will take responsibility of the assigned tasks, they will respect the role of all the group members and they will self-evaluate the performed work in a critical way.

A Moodle's classroom of the course accessible through CAMPUS VIRTUAL (CV) will be used as a news communication tool. It will be also used as a repository platform of all the material in electronic format needed for the course follow-up.

Note: 15 minutes in a lecture session, during the calendar established by the center/studies coordination, will be reserved for the completion of a quiz for the evaluation of lecturers and of the course itself.

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

### Continuous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Laboratory sessions evaluation	25 %	18	0.72	CM03, KM04, SM05
Partial exam (EP1)	37.5 %	6	0.24	KM05, KM06
Partial exam (EP2)	37.5 %	6	0.24	KM05, KM06

#### a) Process and programmed evaluation activities

The course will be evaluated through the following activities:

- EP1: Partial Exam 1. Exam of the first part: Unit 1 to 4. It consists of a theory section and a problems section. 37.5% of FINAL MARK.
- EP2: Partial Exam 2. Exam of second part: Unit 5 to 8. It consists of a theory section and a problems section. 37.5% of FINAL MARK.
- LABINF: Question list of the laboratory sessions. 25% of FINAL MARK. (GROUP ACTIVITY)

The accomplishment of ALL these activities enables the continuous evaluation, as long as the mean mark over 10 obtained from the two exams is equal or higher than 4.5.

The activities with a second opportunity are:

EP1 and EP2, as indicated in section c).

The activities with NO second opportunity are:

LABINF.

To pass the LABINF activity it is necessary:

- 1) To attend ALL laboratory sessions (an absence proof will be required).
- 2) To submit the question list at the end of each laboratory session.

SUMMARY:

$EXAM\ MARK = EP1\_MARK * 0.5 + EP2\_MARK * 0.5$

If  $EXAM\ MARK > 4.5$  then:

$FINAL\ MARK = EXAM\ MARK * 0.75 + LABINF\ MARK * 0.25$

If  $EXAM\ MARK < 4.5$  then:

$FINAL\ MARK = EXAM\ MARK$

ALL marks in the previous expression are considered over 10.

#### b) Evaluation activities programming

The calendar of the evaluation activities\* will be published through the Moodle's classroom (CAMPUS VIRTUAL) during the firsts semester's weeks. In any case, it is foreknown that:

-EP1 will take place at mid semester.

-EP2 will take place at the end of semester.

-The laboratory question list, LABINF, will be submitted at the end of each laboratory session.

\*Theresit exams will be published in the Engineering School's webpage (exams part).

#### c) Retrieval process

According to UAB regulations, the student can only participate in the retrieval process as long as he has fulfilled a set of activities representing at least 2/3 of the final mark of the course. In the case of the present course, this condition is only fulfilled if the student attends both partial exams.

The only retrievable activities are the partial exams EP1 and EP2, by means of a FINAL RESIT EXAM.

This FINAL RESIT EXAM consists of 2 independent parts corresponding to the first part and to the second part, each one of them with their own theory and problems sections (identical structure as partial exams), so that it is possible to retrieve the mark of one single part or the mark of both parts. Thus, the mark of each part, FINAL\_MARK1 and FINAL\_MARK2, substitutes the mark of the corresponding partial exam, EP1\_ MARK and EP2 MARK, as long as the first one overcomes the second one.

Therefore, the FINAL RESIT EXAM will NEVER lead to a mark lower than the obtained through the partial exams.

#### SUMMARY:

$$\text{EXAM MARK} = \text{MAX}(\text{EP1\_ MARK} ; \text{FINAL\_MARK1}) * 0.5 + \text{MAX}(\text{EP2\_ MARK} ; \text{FINAL\_MARK2}) * 0.5$$

If EXAM MARK > 4.5 then:

$$\text{FINAL MARK} = \text{EXAM MARK} * 0.75 + \text{LABINF MARK} * 0.25$$

If EXAM MARK < 4.5 then:

$$\text{FINAL MARK} = \text{EXAM MARK}$$

ALL marks in the previous expression are considered over 10.

#### d) Marks review procedure

For each evaluation activity, it will be indicated (through Campus Virtual) place, date and time for the review with the teacher of the evaluation activity results. In this context, the student will be able to exhibit possible claims about the obtained mark, that will be analyzed by the teacher. Incase the student does not attend the review, any other review activity will be scheduled later.

#### e) Marks

A student will be considered NOT EVALUABLE (NA) if the two following conditions are satisfied:

a) He does not attend none of the two partial exams EP1 or EP2.

b) He does not submit the laboratory question list LABINF.

On the other hand, according to UAB regulations, among those students with a final mark over 9.0, a maximum number of Matr cules d'Honor (MH) corresponding to 5% (rounded by excess) of the total number of students can be granted. In case the number of students is below 20, 1 MH can be granted.

f) Student's irregularities, copy and plagiarism

Without detriment of other disciplinary measures, it will be graded with a zero all the irregularities committed by the student that could lead to a modification in the mark of an evaluation activity. Therefore, copying, plagiarizing, misleading, letting copy, etc. in any of the evaluation activities will imply to fail the activity with a zero.

In this course, the use of Artificial Intelligence (AI) technologies is not allowed at any stage. Any work that includes fragments generated with AI will be considered an act of academic dishonesty and may result in partial or total penalties in the activity grade, or more severe sanctions in serious cases.

g) Evaluation of repeating students

As from the second enrollment, the student may ask to validate the laboratory mark (LABINF MARK) obtained in a previous course. In this case, it is not necessary that the student to notifies this fact to the teacher in charge of the course.

h) Unique evaluation

This course does not foresee a unique evaluation system.

## Bibliography

Circuits i dispositius electrònics: fonaments d'electrònica / Lluís Prats Viñas et al., Edicions UPC. 1998. (ISBN: 8483012367; 9788498800487 (en línia))

R. Boylestad y L. Nashelsky. "Electronic Devices and Circuit Theory", 8ª Ed., Prentice Hall, 2002.  
[https://doi.org/10.1016/S0026-2692\(98\)90008-8](https://doi.org/10.1016/S0026-2692(98)90008-8)

A.Bruce Carlson. Teoría de circuitos: ingeniería, conceptos y análisis de circuitos eléctricos lineales. 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)

R.C. Dorf, J.A. Svoboda. Introduction to electric circuits. John Wiley & Sons. 2014 (ISBN: 0-471-12702-7)

Allan R. Hambley, "Electrónica", Segunda Edición, Prentice Hall, 2001 ISBN: 9788420529998 ISBN ebook: 9788483225875

C. J. Savant Jr., Martin S. Roden, Gordon L. Carpenter, "Diseño Electrónico, Circuitos y sistemas", Tercera Edición, Prentice Hall, 2000.

HORENSTEIN, M. N. "Microelectrónica: circuitos y dispositivos", Prentice-Hall, 2ª ed., 1997

Norbert R. Malik, "Circuitos Electrónicos, Análisis, simulación y diseño", Prentice may, 2000.

José Roldán Viloria "Energías renovables. Lo que hay que saber", Paraninfo, 2013

## Software

As a support software for circuits analysis, it will be used:

PSpice Student

## 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	611	Spanish	first semester	morning-mixed
(PAUL) Classroom practices	612	Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	611	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	612	Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	613	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	614	Catalan	first semester	morning-mixed
(TE) Theory	61	Catalan	first semester	morning-mixed