Universitat Autònoma de Barcelona

2023/2024

Basic Electronics

Code: 106926
ECTS Credits: 6

Degree	Type	Year	Semester
2503743 Management of Smart and Sustainable Cities	FB	1	1

Contact

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Teaching groups languages

You can check it through this link. To consult the language you will need to enter the CODE of the subject. Please note that this information is provisional until 30 November 2023.

Teachers

Rosana Rodriguez Martinez

Prerequisites

Although there are no mandatory academic prerequisites to follow de 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

- KM04 (Knowledge) Interpret technical documents and specification sheets of electronic components.
- KM05 (Knowledge) Describe mathematical models of electronic systems and flows of electricity and matter.
- KM06 (Knowledge) Describe energy storage, generation and distribution systems, as well as the technologies, tools and techniques of environmental engineering.

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: frequència, period and phase

Values associated to periodic signals: pick 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^{st} 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

Methodology

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 stablished 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.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
In person sessions	26	1.04	KM05, KM06, KM05
Laboratory sessions	6	0.24	KM04, KM05, KM04
Problems resolution out of classroom	36	1.44	KM04, KM05, KM06, KM04
Type: Supervised			
Problems ressolution sessions in the classroom	18	0.72	KM05, KM06, KM05
Type: Autonomous			
Individual study	34	1.36	KM04, KM05, KM06, KM04

Assessment

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: Laboratory sessions report. 25% of FINAL MARK.

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 enable the evaluation of the LABINF activity it is necessary:

1) To attend ALL laboratory sessions (an absence proof will be required).

2) To submit the report before deadline.

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 report, LABINF, will be submitted not later the resit exam*, following the procedure indicated in the Moodle'sclassroom.

*The resit 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:

EXAM MARK = MAX(EP1_ MARK ; FINAL_MARK1)*0.5 + MAX(EP2_ MARK ; FINAL_MARK2)*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.

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 one of the two following conditions is satisfied:

a) He does not attend at least one of the two partial exams EP1 or EP2.

b) He does not submit the laboratory report LABINF.

On the other hand, according to UAB regulations, among those students with a final mark over 9.0, a maximum number of Matrícules 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.

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.

Assessment Activities

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

Bibliography

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R. Boylestad y L. Nashelsky. "Electronic Devices and Circuit Theory", 8ª Ed., Prentice Hall, 2002.

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)

R.C. Dorf, J.A. Svoboda. Introduction to electric circuits. John Wiley & Sons. 1996 (ISBN: 0-471-12702-7)

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.

HORENSTEIN, M. N. "Microelectrónica: circuitos y dispositivos", Prentice-Hall, 2ª de., 1997 C.J. Savant, M.S. Roden y G.L. Carpenter, "Diseño Electrónico. Circuitos y Sistemas", Ed. Addison-Wesley Iberoamericana, 1992.

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