UAB
Universitat Autònoma de Barcelona

Electronic Circuits and Technologies

Code: 102730
ECTS Credits: 6

2024/2025

Degree	Type	Year
2500895 Electronic Engineering for Telecommunication	OB	3

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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

To introduce basic design methods of analog and digital electronic filters. To introduce the fundamental concepts of electronic systems fabrication technology. To know the characteristics of components data sheet and criteria for their selection. To study in detail the materials, types and techniques for processing and assembling of conventional printed circuits and hybrid circuits. To carry out in the laboratory the complete process to develop a filter: design, prototype, fabrication/assembly and test. To give a general overview of electronic circuits test.

Competences

- Communication
- Design components and electronic circuits in accordance with specifications
- Develop personal attitude.
- Develop personal work habits.
- Develop thinking habits.
- Systematically focus the design of electronic applications and products.

Learning Outcomes

1. Adapt to unforeseen situations.
2. Communicate efficiently, orally and in writing, knowledge, results and skills, both professionally and to non-expert audiences.
3. Design analogue and digital electronic circuits: filters.
4. Develop critical thinking and reasoning.
5. Develop curiosity and creativity.
6. Generate innovative and competitive proposals in professional activity.
7. Maintain a proactive and dynamic attitude with regard to one's own professional career, personal growth and continuing education. Have the will to overcome difficulties.
8. Make one's own decisions.
9. Manage available time and resources. Work in an organised manner.
10. Optimize the final features of the design of a circuit or system by choosing the appropriate technology for implementation.
11. Work autonomously.
12. Work in complex or uncertain surroundings and with limited resources.

Content

Theory

PART I

UNIT 1. Analogic filters

First and second order filters. Passive and active implementations with operational amplifiers. Polynomial approximations. High order filters.

UNIT 2. Digital filters

Non-recursive digital filters (FIR). Implementations and windowing. Recursive digital filters (IIR)

PART II

UNIT 3. Components for electronic circuits

Components classification: passives (R, L, C, transformers), semiconductors (diode, thyristor, triac, transistors) and optoelectronics (LED, optocoupler). Study of the data sheet characteristics. Packaging: DIL, SMD. Electric characteristics versus material characteristics and fabrication processes. Thermal issues.

UNIT 4. Printed circuit technology

Fabriacation lines and classes. Materials and types of substrates. Processing techniques. Place/insertion and components welding techniques. Thermal issues.

UNIT 5. Hybrid circuits technologies

Thin film hybrid circuits. Thick film hybrid circuits. Hybrid integrated circuits. Multichip modules (MCM). Thermal issues.

Laboratory sessions

Full development process of a electronic filter:

1) Design and simulation of the filter. Component's election.

2) Design of filter's printed circuit board (PCB).

3) Fabrication of filter's printed circuit board.

4) Assembly of filter's printed circuit board.

5) Test of filter's printed circuit board.

At the end of the course, the student must submit a single report collecting the results obtained in the laboratory sessions. This report will have a maximum extension of 20 pages. Besides, the results will be synthetically presented also in DINA3 poster format.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
In person sessions	28	1.12	4
Type: Supervised			
Problems resolution	28	1.12	10
Type: Autonomous			
Study of specific teaching materials	70	2.8	3

Methodologically, the subject is proposed in a bimodal format:

In the first part of the subject, devoted to the introduction of concepts and design techniques of analog and digital filters, the student will work in an autonomous way with the support of the materials published in Campus Virtual, in person/guiding theory sessions and sessions for problems resolution.

In the second part, devoted to the fabrication technology, theory and problems resolution sessions will be carried out through master classes.

In the laboratory sessions, the student will practice the concepts acquired in both parts of the subject.

In general, a Moodle's classroom, accessible through CAMPUS VIRTUAL (CV), will be used as a communication tool of news and as a repository of all the material in electronic format needed to follow the subject.

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

Exam	75%	6	0.24	2, 3, 4, 7, 9
Laboratory sessions	25%	18	0.72	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12

a) Process and programmed evaluation activities

The subject will be evaluated through the following activities:

- EP1: Partial Exam 1. Exam of part 1: Technological processes. It consists of a theory section and a problems section. 37.5% of FINAL MARK.

- EP2: Partial Exam 2. Exam of part 2: MOS transistor. It consists of a theory section and a problems section. 37.5% of FINAL MARK.

- LABINF: Laboratory sessions report (report version 20 pages). 12.5% of FINAL MARK. (GROUP ACTIVITY)

- LABPOS: Laboratory sessions report (poster version). 12.5% 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 and LABPOS.

To pass the LABINF activity it is necessary:

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

2) To submit both reports before deadline.

SUMMARY:

EXAM MARK = EP1_MARK*0.5 + EP2_MARK*0.5

LABINF MARK = LABINF_MARK*0.5 + LABPOS_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: last week dedicated to Part 1 (just before or after Easter).

-EP2 will take place at the end of semester: last week dedicated to Part 2 (just before resit exams period).

-The laboratory report, LABINF and LABPOS, will be submitted not later the resit exam*, following the procedure indicated in the Moodle's classroom.

*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 subject. In the case of the present subject, 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 Part 1 (Filters) and Part 2 (Fabrication technology), 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

LABINF MARK = LABINF_MARK*0.5 + LABPOS_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.

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 bythe teacher. In case 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/she does not attend none of the two partial exams EP1 or EP2.

b) He/she 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 subject.

Bibliography

PART I. Filters

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PART II. Technology

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Software

For the printed circuit boards design we use:

Eagle

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	321	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	321	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	322	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	323	Catalan	second semester	morning-mixed
(TE) Theory	320	Catalan	second semester	morning-mixed