UAB
Universitat Autònoma de Barcelona

Electronic Circuits and Technologies

2026/2027

Code: 102730
Credits: 6

Degree programme	Type	Course
Electronic Engineering for Telecommunication	OB	3

Contact lecturer

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Teaching staff

Francesc Torres Canals

Group languages

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

Prerequisites

There are no prerequisites

Objectives

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.

Learning outcomes

1. Design analogue and digital electronic circuits: filters.
2. Optimize the final features of the design of a circuit or system by choosing the appropriate technology for implementation.
3. Develop critical thinking and reasoning.
4. Work autonomously.
5. Develop independent learning strategies.
6. Manage available time and resources. Work in an organised manner.
7. Make one's own decisions.
8. Adapt to unforeseen situations.
9. Work in complex or uncertain surroundings and with limited resources.
10. Critically evaluate the work done.
11. Communicate efficiently, orally and in writing, knowledge, results and skills, both professionally and to

non-expert audiences.
12. Efficiently use ICT for the communication and transmission of ideas and results.
13. 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.
14. Develop curiosity and creativity.
15. Generate innovative and competitive proposals in professional activity.

Contents

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 15 pages.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
In person sessions	28	1.12	3, 5, 10, 11, 12
Problems resolution	28	1.12	2, 5, 10, 12
Study of specific teaching materials	70	2.8	1, 5, 10, 12

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

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Laboratory sessions	25%	18	0.72	1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15
Exam	75%	6	0.24	1, 3, 5, 6, 10, 11, 12, 13

In this subject the single assessment is not considered

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). 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 activity with NO second opportunity is:

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 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: 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, 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

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, and in accordance with current academic regulations, it will be graded with a zero (0) 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 (0), WITH NO OPTION TO RETRIEVAL.

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.

h) Use of AI

In this course, the use of Artificial Intelligence (AI) technologies is prohibited in any phase. Any work that includes AI-generated fragments will be considered a breach of academic dishonesty and may result in a partial or total penalty on the assignment grade, or greater penalties in serious cases.

Bibliography

PART I. Filters

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PART II. Technology

Edwards. Manufacturing Technology in the Electronic Industry. Chapman&Hall (1991).

Rowland y Belangia. Tecnología de Montaje Superficial Aplicada. Paraninfo (1994).

Coombs. Printed Circuits Handbook. 4th edition. McGraw Hill (1995).

Wassink and Verguld. Manufacturing Techniques for Surface Mounted Assemblies. Electrochemical Publications (1995).

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P. Horowitz and W. Hill. The Art of Electronics. Cambridge University Press (1990).

A. Bandera, J.A. Rodríguez i F.J. Sánchez. Tecnología Electrónica: Materiales y técnicas de fabricación. Universidad de Màlaga / Manuales (2002).

Software

For the printed circuit boards design we use:

Eagle

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TE) Theory	320	Catalan	second semester	morning-mixed
(PAUL) Classroom practices	321	Catalan	second semester	morning-mixed
(PLAB) Practical laboratories	321	Catalan/Spanish	second semester	morning-mixed
(PAUL)	322	Catalan	second	morning-mixed

Classroom practices			semester	
(PLAB) Practical laboratories	322	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	323	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	324	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	325	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	326	Catalan/Spanish	second semester	morning-mixed