Universitat Autònoma de Barcelona

2023/2024

Analog Electronics

Code: 102688
ECTS Credits: 6

Degree	Type	Year	Semester
2500895 Electronic Engineering for Telecommunication	OB	2	2
2500898 Telecommunication Systems Engineering	OB	2	2

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

Montserrat Nafría Maqueda

Prerequisites

Although there are no compulsory academic prerequisites to take the subject, it is advisable to have achieved the competences and a good knowledge of the contents of the subjects of "Theory of circuits and electronics", "Fundamentals of signals and systems" and "Components and electronic circuits ".

Objectives and Contextualisation

Describe the main features and use the basic components and circuits of analog electronics.

Analyze the temporal and frequency response characteristics of the circuits and basic analog components.

Design simple analog circuits based on their specifications.

Describe the fundamentals of analog integrated circuits and power circuits.

Competences

- Electronic Engineering for Telecommunication
  - Communication

- Develop personal attitude.
- Develop personal work habits.
- Develop thinking habits.
- Learn new methods and technologies, building on basic technological knowledge, to be able to adapt to new situations.
- Resolve problems with initiative and creativity. Make decisions. Communicate and transmit knowledge, skills and abilities, in awareness of the ethical and professional responsibilities involved in a telecommunications engineer's work.
- Work in a multidisciplinary group and in a multilingual environment, and communicate, both in writing and orally, knowledge, procedures, results and ideas related with telecommunications and electronics
- Work in a team.

Telecommunication Systems Engineering

- Communication
- Develop personal attitude.
- Develop personal work habits.
- Develop thinking habits.
- Learn new methods and technologies, building on basic technological knowledge, to be able to adapt to new situations.
- Resolve problems with initiative and creativity. Make decisions. Communicate and transmit knowledge, skills and abilities, in awareness of the ethical and professional responsibilities involved in a telecommunications engineer's work.
- Work in a multidisciplinary group and in a multilingual environment, and communicate, both in writing and orally, knowledge, procedures, results and ideas related with telecommunications and electronics.
- Work in a team.

Learning Outcomes

1. Assume and respect the role of the different members of a team, as well as the different levels of dependency in the team.
2. Communicate efficiently, orally and in writing, knowledge, results and skills, both professionally and to non-expert audiences.
3. Develop critical thinking and reasoning.
4. Develop curiosity and creativity.
5. Develop independent learning strategies.
6. Develop the capacity for analysis and synthesis.
7. Draft brief reports on the inherent structure of telecommunication and electronics projects.
8. Efficiently use ICT for the communication and transmission of ideas and results.
9. 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.
10. 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.
11. Manage available time and resources.
12. Manage available time and resources. Work in an organised manner.
13. Use analogue and digital electronic, analogue-digital conversion, radiofrequency, power supply and electrical energy conversion circuits in telecommunication and computation applications.
14. Use communication and computer applications to support the development and exploitation of telecommunication and electronic networks, services and applications.
15. Use computer tools to research bibliographic resources and information on electronics.
16. Use computer tools to simulate telecommunication and electronic circuits and systems.
17. Use different sources of energy and especially solar, photovoltaic and thermal, as well as the basics of electrical engineering and power electronics.
18. Use different sources of energy as well as the fundamentals of power electronics.
19. Work autonomously.
20. Work cooperatively.

Content

Polarization circuits. Linear amplifiers with bipolar transistors and FET; Frequency response; Power amplifiers. Filters Feedback circuits. Stability. Study of the real operational amplifier. Circuits with operationals. Signal generators; Integrated analog subsystems (current sources and active loads).

Methodology

Teaching methodology will combine supervised and supervised activities, apart from self-employment. The supervised activities will combine master classes, seminars of problems and cases and lab sessions. In the lectures, the teacher will synthesize and explain the fundamental concepts of the subject. In the seminars of problems and cases, students will solve problems related to the subject of the subject. In the laboratory sessions, the student will put into practice, in the laboratory, the knowledge acquired.

The supervised activities will consist of tutorials, in which the student, by prior appointment with the teacher, will be able to solve, individually or in group, doubts derived from the accomplishment of the rest of activities (directed and autonomous).

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			
Lab sessions	15	0.6	1, 2, 6, 4, 3, 8, 7, 20, 14, 13, 17, 18, 15, 16
Master classes	24	0.96	3, 13, 17, 18, 15
Problems and cases seminars	15	0.6	6, 4, 7, 20, 19, 13, 17, 18, 16
Type: Supervised			
Tutorials	5	0.2	13, 17, 18, 16
Type: Autonomous			
Oral presentations and Writing reports	5	0.2	2, 8, 7, 14, 13, 17, 18
Preparation of laboratory sessions and completion of the report	30	1.2	1, 2, 6, 7, 20, 13, 17, 18, 15, 16
Problem solving and case studies	30	1.2	5, 6, 4, 3, 12, 19
Study	20	0.8	5, 6, 4, 3, 12, 19, 13, 17, 18, 15, 16

Assessment

Continued avaluation

Laboratory lessons

To consider that a laboratory practice has been done, it is mandatory the realization of the previous study (if needed), to attend the laboratory lecture and deliver the final report.

Completion of all the practices is mandatory.

The final mark of the laboratory part will be calculated by averaging the marks obtained in each of the laboratori practices. This mark will constitute 25% of the final mark of the course.

Requirement: to have done all the lab sessions and to get a minimum mark of 5.

In the case that the student does not make a lab practrice, the final mark of practices will be zero.

It is necessary to keep in mind that the laboratory practices are not recoverable and, therefore, if the student fails this part , the course cannot be approved.

The procedure for the validation of practices carried out in previous courses (if applicable) will be established at the beginning of the semester and will be published in the cv.

Midterm exams

There will be two partial exams throughout the semester.

The average of these exams will constitute 75% of the mark of the course.

Requirement: Minimum mark of 3 at each of the midterm exams and 4.5 of average between the two, to weight with the lab mark.

If the final mark of partial exams is lower than 4.5 (or that in one of the partial ones it is less than 3), the student can make the final exam, provided that the conditions are fulfilled to make this exam.

In the case that the mark of the continuous evaluation of the course, resulting from teh weighting of the mark of the two evaluable concepts (lab amb exams), is less than 5, the student will be allowed to make the final exam that will be carried out at the end of the semester.

Final exam (recovery exam)

The students can present to the final exam, whenever they have done the laboratory practices (compulsory and with a minimum mark of 5) and at least a partial exam.

If the student has to take the final exam, a minimum of 4.5 will be required in the mark of this exam to do the average with that of laboratory practices.

The final exam will have a weight of 75% and will be weighted with 25% of the lab marks (provided that the minimum needed to average has been achieved), to determine the final mark of the course.

It will be an exam in which all the contents of the subject will be assessed (regardless any of the partial exams was approved).

Final exam to improve the mark

If the student takes the final exam to improve the grade resulting from the continuous assessment, the mark that is improved is that of the midterm exams. In order to determine the final mark of the course, the mark of the laboratory practices will be considered, with the same weighting that is considered for the continuous assessment. The mark for the exam part will be considered the best mark for the midterm and final exam.

Final mark of the subject in case of not approving:

In case the student does not pass the subject, to determine the final grade that will appear in the student's file, the following cases are considered:

1. The student has not been submitted to any of the partial exams or the final exam. The final grade will be 'Not evaluable'.

2. It has not been submitted to the final exam, but one or both partial exams and the mark in the partial exams is above the required minimum. If the average of the partial notes do not reach the minimummark necessary to weight with the rest of the notes. The final grade will be the average of the marks of the partial exams.

3. He/she has not attended to thefinal exam, but to one or both partial exams. Ifin some of the partial exams the mark is under the required minimum, the final mark will be the average of the marks in the partial exams, with a maximum of 4.5

4. It has been submitted to the final exam, but the grade is lower than the minimum necessary to weight with the rest of the grades. The final grade will be the highest of the average of the partials and the final exam, taking into account the considerations on the marks of the partial exams mentioned in points 2 and 3.

5. The student has presented one or both of the partial exams and / or the final exam, but they have not done all the practices or has suspended them. The final grade of the subject will be zero, in case they have not done any practice, or the practice mark, in case the student has failed the lab sessions.

Excellent with honors.

The excelent with honors mark will be given on the basis or the criteria fixed by the professors at the end of the year, taking into account the number that can be given.

Reviews of marks

For each evaluation activity, a place, date and time of revision in which the student can review the activity with the teacher will be indicated. If the student does not appear in this review, this activity will not be reviewed later .

Observations

Any other case not contemplated in this regulation will be analyzed individually.

General remarks.

1. Without prejudice to other disciplinary measures deemed appropriate, and in accordance with current academic regulations, the irregularities committed by the student that may lead to a variation of the rating of an evaluation act will be scored with a zero. Therefore, copying or allowing to copy a practice or any other evaluation activity will involve suspending with azero, and if it is necessary to pass this score to pass the subject, the whole subject will be suspended. The evaluation activities qualified in this way and by this procedure will not be recoverable, and therefore the subject will be suspendeddirectly without the opportunity to recover it in the same academic year.

2. The dates of continuous evaluation and delivery of works will be published in the virtual campus and may be subject to possible changes in programming due to adaptation to possible incidents. You will always be informed on the virtual campus about these changes as it isunderstood that this is the usual platform for exchanging informationbetween teachers and students.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Laboratory sessions and corresponding reports	25%	0	0	1, 2, 5, 4, 3, 8, 12, 9, 10, 7, 20, 19, 14, 17, 18, 15, 16
Written exams	75%	6	0.24	2, 5, 6, 3, 11, 12, 13, 17, 18, 15

Bibliography

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

L. Nashelsky y Robert L. Boylestad, "Electrónica: teoría de circuitos y dispositivos electrónicos", Ed. Pearson, 2018. Available in electronic format

Allan R. Hambley, "Electrónica", Segunda Edición, Prentice Hall, 2001. Available in electronic format

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

J. Millman y A. Grabel. "Microelectrónica". Ed. Hispano Europea. 1991

Horowitz-Hill , "The Art of Electronics", Cambridge University Press 1989.

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

Software

PSPICE circuit simulator.