VNIVERSITAT DE VALÈNCIA

Course Guide
34813 Analogue electronics I

COURSE DATA

Data Subject	
Code	34813
Name	Analogue electronics I
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1402 - Degree in Telecommunications Electronic Engineering	School of Engineering	2	Second term

Subject-matter

Degree	Subject-matter	Character
1402 - Degree in Telecommunications Electronic Engineering	16 - Electronics	Obligatory

Coordination

Name	Department
MAGDALENA BENEDICTO, JOSE RAFAEL	242 - Electronic Engineering

SUMMARY

Analogue Electronics I is a subject of a second degree course in *Electronics & Telecommunication Engineering.* As shown in the curriculum, the descriptors of this subject within the subject "Electronics" establish the following topics:

1. Signals, systems and basic analog components.
2. Transistor amplifiers and feedback in electronic systems.
3. Power supplies and regulators.
4. Operational amplifiers.
5. Analog-digital conversion.

It is, therefore, a subject whose content is essential for the initiation of Grade in *Electronics & Telecommunication Engineering.* This subject is continued in the Analogue Electronics II to be taught in the third year of the same degree.
Analog Electronics I reviews the most commonly used electronic components, both passive and active, and basic circuits, giving the practical procedures for use in the laboratory.

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

For the successful use of this subject should have prior knowledge acquired in the subjects of Electronic Circuits and Electronic and Photonic Devices.

OUTCOMES

1402 - Degree in Telecommunications Electronic Engineering

- G3 - Acquisition of the knowledge of the basic and technological subjects that allows students to learn new methods and theories and endows them with the versatility to adapt to new situations.
- G4 - Ability to solve problems with initiative, decision-making and creativity, and to communicate and transmit knowledge, abilities and skills, understanding the ethical and professional responsibility of the activity of a telecommunications technical engineer.
- G9 - Ability to work in a multidisciplinary environment and in a multilingual group and to communicate, in writing and orally, knowledge, procedures, results and ideas related to telecommunications and electronics.
- G6 - Ability in the handling of specifications, regulations and norms of compulsory compliance.
- TE5 - Ability to design circuits for analog and digital electronics, analog-digital and digital-analog conversion, radio frequency, power and power conversion for telecommunications and computing applications.

LEARNING OUTCOMES

After completing this course, students will be able to:

- Analyze in detail the behavior of any linear analog circuit of medium difficulty (G3,G5).
- Know the different types of devices to address analog electronic design (G3,G6).
- Knowing how to choose the most appropriate type of circuit according to the needs of a design. (G4,TE5).
- To design an electronic system that meets a set of specifications. (G4,TE5).
- Perform the circuit diagram and its simulation. (G4,TE5).

- Proceed with the physical realization of a prototype and testing. (G4,TE5).
- Knowing how to choose the type of amplifier circuit more suitable to the needs of a design. (G4,G6).
- Know linear power design that meets a set of specifications. (G4,G6,TE5).
- Understand in detail the structure of an operational amplifier and the basis of operational design of circuits. (G4,G6,TE5).

DESCRIPTION OF CONTENTS

1. Introduction and basic elements

Item 1. Signals, systems and basic analog components.
1.1. Basic definitions: device, system and signal
1.2. Analog and digital electrical signals
1.3 Specification of a system or electronic circuit
1.4. Basic analog components

2. Amplifiers

Item 2. Transistor signal amplifiers.
2.1. The BJT amplifier
2.1.1. Common emitter amplifier
2.1.2. Common collector amplifier
2.1.3. Common base amplifier
2.2. The FET amplifier
2.2.1. Common source amplifier
2.2.2. Common drain amplifier
2.2.3. Common gate amplifier
2.3. The differential amplifier

Item 3. Frequency response of amplifiers.
3.1. Characteristics of the frequency response of an amplifier
3.2. Model and frequency response of BJT
3.3. Frequency response of amplifiers with common-emitter BJT
3.4. Coupling capacitor

3. Feedback and operational amplifiers

Item 4. Feedback in amplifiers.
4.1. Feedback concept
4.2. Feedback effects on amplification
4.3. Types of feedback

Item 5. The operational amplifier.
5.1. General properties of the operational amplifier

5.2. Inverting amplifier
5.3. Noninverting amplifier
5.4. Limitations of real operational amplifier
5.5. Circuits with operational amplifiers

4. Power supplies

Item 6. Power supplies and regulators.
6.1. Introduction
6.2. Transformers
6.3. Rectification
6.4. Regulators

5. Analog-to-digital and digital-to-analog conversion

Item 7. Analog-to-digital and digital-to-analog conversion.
7.1. Introduction.
7.2. Digital-to-analog converters: types.
7.3. Analog-to-digital converters: types.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Development of group work	20,00	0
Study and independent work	15,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	15,00	0
Preparation of practical classes and problem	20,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The teaching methodology is organized in three types of activities. In all cases, the student will have access in advance to the teaching material related to the contents of the subject through the Virtual Classroom (the University of Valencia's e-learning platform), in order to facilitate the preparation of the classes. The content will be based on notes, transparencies and multimedia material, both internal and external, in order to reinforce concepts. The students will have an approximate timing of the development of the subject during the whole term. Attendance to all face-to-face classes will be noted.

- **Theory classes.** In the theory classes the topics will be developed providing a global and integrating vision, analyzing with more detail the key and more complex aspects. To encourage student participation, the master classes will alternate with examples to be solved jointly by the teacher and the students. The teacher will also be able to evaluate the student's previous preparation by means of questions at the beginning of the class. Emphasis will also be placed on practical aspects of design and engineering. During the classes and at the end of each topic there will be exercises and questionnaires that can be handed in, both on paper and in digital format.

- **Classes of problems.** In the practical classes there will be sessions of discussion and resolution of the most significant problems of each section of the subject. There will be problem reports that will be developed in groups, with some sessions in class, and later exposed by the students for discussion. We will tend to the inverse class methodology. (G9, G4, TE5)

- **Lab classes.** In each laboratory class, both the previous preparation of the practice to be carried out, by checking the design and simulation of the circuits, and the final results will be evaluated. An attendance control will be carried out. (G9, G4,TE5)

EVALUATION

The evaluation of learning will be done by prioritizing continuous assessment and student participation throughout the course, and through a final theory and laboratory exam. The evaluation will measure the achievement of the objectives in two blocks: Block A, which will collect the theory knowledge and Block B, which will collect the practical and laboratory knowledge. It will be necessary to obtain a minimum score of 4 in both blocks to pass the minimum required knowledge and . The final grade will be the weighted average of both blocks as specified below.

There will be two calls for examinations coinciding with the official calls.

First call. The first call will give priority to continuous assessment and the student's work. The percentage allocation of each part of the evaluation in the first call will be as follows:

Block A: theory

- Attendance and participation: 10%.

- Classroom work: 15%

- Final theory exam: 35%

Block B: practical activities

- Lab: 15%

- Presentation of problems: 25%

The final theory exam will be taken individually on the date, time and place officially designated by the centre and will evaluate the knowledge and concepts acquired by the student and his/her ability to solve problems based on the experience, knowledge and skills acquired. It will be necessary to obtain a minimum score of 4 in the exam to pass the minimum required knowledge.

The attendance and participation grade will be proportional to the attendance of the student to the face-to-face classes, and to the participation in the tasks proposed in the same one, giving priority to the one of the activities of voluntary character. The quality and attention of the interventions in the discussions of the problems will be valued.

The grade of the work in class will be obtained by evaluating and averaging the results of the questionnaires, problems and challenges, both in digital and physical format, that the teacher raises during the classes.

The laboratory grade will be obtained as a result of the evaluation of each practice, which will be divided into previous calculations and the performance of the practice. They can be evaluated by means of questions, questionnaires or deliverable reports, according to the nature of the practice. The continuous evaluation of each practice (preparation 30%, accomplishment 70%) will constitute the total of the final laboratory note. The teacher may keep this laboratory note by performing practices in person and continuous evaluation for the next course.

The note of the presentation of problems will be obtained from the evaluation by the teacher of the formal quality of the material presented, the technical quality of the solution, the answer to the questions during the discussion after the solution and the inclusion of new aspects or not seen in class, all in equal parts.

Second call: The percentage allocation of each part of the evaluation in the first call will be as follows:

Block A: theory

- Attendance and participation: 5%.
- Classroom work: 10%.
- Final theory exam: 55%.

Block B: practical activities

- Lab: 15%
- Presentation of problems: 15%

The final theory exam will be taken individually on the date, time and place officially designated by the centre and will evaluate the knowledge and concepts acquired by the student and his/her ability to solve problems based on the experience, knowledge and skills acquired. It will be necessary to obtain a minimum score of 4 in the exam to pass the minimum required knowledge.

The attendance and participation grade will be proportional to the attendance of the student to the face-to-face classes, and to the participation in the tasks proposed in the same one, giving priority to the one of the activities of voluntary character. The quality and attention of the interventions in the discussions of the problems will be valued.

The grade of the work in class will be obtained by evaluating and averaging the results of the questionnaires, problems and challenges, both in digital and physical format, that the teacher raises during the classes.

The mark of the presentation of problems will be obtained from the evaluation by the teacher of the formal quality of the material presented, the technical quality of the solution, the answer to the questions during the debate after the solution and the inclusion of new aspects or not seen in class, all in equal parts. If the student has not presented the problems through continuous assessment, he/she must request a list of problems from the teacher and individually present a report on the solution of these problems and a digital presentation of the same before the day of the second call for the exam.

The laboratory grade will be obtained as a result of evaluating each practice, which will be divided into previous calculations and performance of the practice. They may be evaluated by means of questions, questionnaires or deliverable reports, depending on the nature of the practice. The continuous evaluation of each practice (preparation 30%, performance 70%) will constitute the total of the practice. For students who have not obtained a mark of 4 or higher attending the laboratories, there will be an examination in this call on the date and time officially designated by the centre for the official examination of the subject in the second call, after the final theory exam. In this case, the mark of this exam will represent 100% of the mark of the laboratory block, and it will be essential to obtain at least a 4 out of 10. Students who have not attended the laboratory during the course at least 75% of the sessions, will not be able to take this exam.

REFERENCES

Basic

- Referencia b1: Allan R. Hambley. Electrónica. Pearson Education, 2001.

  Referencia b2: Horowitz-Hill. The Art of Electronics. Cambridge University Press 1989.

  Referencia b3: Espí, Camps, Muñoz. Fundamentos de Electrónica Analógica. Servicio de Publicaciones de la Universidad de Valencia (SPUV), 2006.
  Referencia b4: Espí, Camps, Muñoz. Electrónica Analógica: Problemas y cuestiones. Prentice Hall. Serie Prentice/Práctica, 2006.
  Referencia b5: Documentación preparada por el profesorado para la asignatura, accesible a los alumnos a través de Aula Virtual.

Additional

- Referencia c1: J. Millman y A. Grabel. "Microelectrónica" Ed. Hispano Europea. 1991
  Referencia c2: Enlaces web específicos y aplicaciones de electrónica: empresas del sector y hojas de características de componentes.