Universidad Zaragoza

Academic Year/course: 2021/22

30307 - Basic principles of electronics

Syllabus Information

Academic Year: 2021/22
Subject: 30307 - Basic principles of electronics
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 330 - Complementos de formación Máster/Doctorado
581 - Bachelor's Degree in Telecomunications Technology and Services Engineering
ECTS: 6.0
Year: 581 - Bachelor's Degree in Telecomunications Technology and Services Engineering: 2
330 - Complementos de formación Máster/Doctorado: XX

Semester: First semester
Subject Type: 581 - Basic Education
330 - ENG/Complementos de Formación
Module:

1. General information

1.1. Aims of the course

The general objective of this course is to provide students with a basic knowledge of Electronics, as well as to introduce them to the usual terminology and to enable them to analyse simple electronic circuits.

For this purpose, the most common electronic devices are presented, first studying their internal functioning. Next, the most representative stages of each device are presented and, finally, the methodology that allows the analysis of electronic stages based on these devices is introduced.

These approaches and objectives are aligned with some of the Sustainable Development Goals, SDGs, of the 2030 Agenda (https://www.un.org/sustainabledevelopment/es/) and certain specific targets, so that the acquisition of the learning outcomes of the subject provides training and competence to the student to contribute to some extent to their achievement:

- Goal 7: Ensure access to affordable, secure, sustainable and modern energy for all.
  - Target 7.2 By 2030, increase significantly the share of renewable energy in the total energy mix.
  - Target 7.3 By 2030, double the global rate of improvement in energy efficiency.
- Goal 8: Decent work and economic growth.
  - Target 8.4 By 2030, progressively improve global resource efficiency in production and consumption and aim to decouple economic growth from environmental degradation, in line with the 10-Year Framework of Programmes on Sustainable Consumption and Production Patterns, starting with developed countries.

1.2. Context and importance of this course in the degree

The subject is part of the basic subject of initial training called "Electronic Technology, Circuits and Systems" which covers basic and general training skills of the degree in Engineering Technologies and Telecommunication Services. This qualification qualifies for the profession of technical telecommunication engineer in the specific technologies of telecommunication systems, telematics, electronic systems and sound and image. The four itineraries share 60 credits of the basic training module to which this subject belongs.

1.3. Recommendations to take this course

It is recommended that students have taken the course "Circuits and Systems".

2. Learning goals

2.1. Competences

General/Transverse competences of the Engineering degree degrees of the Rio Ebro Campus:

1. Ability to solve problems and make decisions with initiative, creativity and critical reasoning.

2. Ability to work in a multidisciplinary group and in a multilingual environment.

3. Ability to manage information, manage and apply the technical specifications and legislation necessary for the practice of Engineering.

Basic training skills:

4. Understanding and mastery of the basic concepts of linear systems and related functions and transforms, theory of electrical circuits, electronic circuits, physical principle of semiconductors and logical families, electronic and photonic devices, materials technology and its application for the resolution of engineering problems.

2.2. Learning goals

In order to pass this subject, the student must demonstrate the following results:

RA1- Be able to describe, define and explain the basic concepts of electronic circuits, physical principles of semiconductors and logical families as well as electronic and photonic devices and materials technology.

RA2- Be able to select and use the physical principles of electronic circuits and semiconductors to solve engineering problems.

RA3- Be able to assemble and measure circuits in the laboratory. Be able to solve efficiently the debugging of faults in simple electronic systems and to use the laboratory instruments with fluidity and efficiency.

RA4- Be able to use and explain manuals and specifications of the electronic devices presented.

RA5- Be able to plan group work, identifying objectives, managing time and tasks.

2.3. Importance of learning goals

The knowledge and understanding of Electronics is essential for the exercise of the skills of a graduate in Engineering Technologies and Telecommunication Services, so the skills acquired in this subject will be very useful for their training.

In a society in which Electronics is a "cornerstone", the concepts explained in this course will allow the student to begin to understand the technological bases and functioning of the multiple electronic devices that surround us.

The experimental training in the laboratory is irreplaceable for the graduate in Engineering of Telecommunications Technologies and Services and allows him to bring theoretical approaches to the reality of experimental assemblies.

The subject "Fundamentals of Electronics" lays the necessary foundations to successfully undertake the other subjects related to Electronics that are taught in the degree.

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

This subject has an exceptional seal of continuous evaluation in its practical part (According to Art. 9.4 of the Regulation of evaluation), which implies the obligation of attendance and monitoring by the student. Therefore, the grade in this activity is transferred to the global tests with no possibility of recovery. This practical part includes two interrelated assessment activities:

AE1. Delivery of results of practical work, with preparatory cases of the contents of practical sessions. Its value will be 20% of the final grade of the subject. This activity covers the learning outcomes RA2, RA3, RA4 and RA5.

AE2. Evaluation of the development and results of the practical session. The evaluation criteria will be based on the following aspects:

-Order, layout and assembly of circuit components.

-Proper use and handling of laboratory instruments.

-Ability to locate and correct assembly faults

Verification of results obtained based on circuits explained in the face-to-face classes.

Its value will be 30% of the final grade of the course. This activity covers learning outcomes RA3, RA4 and RA5.

On the dates indicated by the Centre as days of global evaluation of the subject, a written test (PE) covering the contents of the subject program appearing under the heading "Activities and resources" will be carried out. Its value will be 50% of the final grade with a minimum score of 4.0 points out of 10. It will be separated into two evaluation activities:

AE3. Essential theoretical-practical questionnaire: The grading criterion will evaluate the student's reasoning capacity about specific electronic application stages. Its value will be 40% of the written test with a minimum score of 2.5 points out of 10 points. This activity covers learning outcomes RA1 and RA2.

AE4. Numerical resolution of practical exercises applied to more complex electronic circuits. The grading criteria will assess the student's ability to use a methodology of hypothesis, resolution and verification of the exercises. Its value will be 60% of the written test with a minimum score of 2.5 points out of 10 points. This activity covers learning outcomes RA1 and RA2.

The final grade of the course will be:

0.2xAE1 + 0.3xAE2 + 0.5xPE

If the minimum grade is not passed in any of the sections of the written test, the grades corresponding to sections AE1 (practical work) and AE2 (laboratory practice) will not be added to the final grade, and the subject will then be graded:

0.5xPE

The subject is passed with a total grade of 5 points out of 10.

GLOBAL TEST (OFFICIAL CALLS)

The overall assessment of the student will be carried out by means of the following tests:

- Written test: grade from 0 to 10 points (50%). This examination coincides with the AE3 and AE4 activities.

- Laboratory test: score from 0 to 10 points (30% if the AE1 assessment activity has been presented; or 50% if the AE1 assessment activity has not been presented during the course).

The examination will consist of the implementation of circuits similar to those developed during the course in the laboratory practice sessions. The design methodology, the functioning of the circuit and the handling of the laboratory instruments will be evaluated.

Due to the need to prepare the logistics associated with the laboratory examination, in order to attend the same, a previous request will be required on the part of the student within the period that will be communicated in class.

The overall grade of the subject will be:

0.2xAE1 + 0.3xAE2 + 0.5xPE

If the student has passed the AE1 assessment activity, or:

0.5xAE2 + 0.5xP

If the student has not passed the AE1 assessment activity:

If the minimum grade is not passed in any of the sections of the written test, the grades corresponding to sections AE1 (practical work) and AE2 (laboratory practice) will not be added to the final grade, being then the grade of the subject:

0.5xPE

The subject is passed with an overall grade of 5 points out of 10.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The proposed methodology seeks to encourage continued student work.

Activities with the whole group, divided into lectures and classroom practices in which problems of application of the subject in telecommunications are solved. The participation of the students in these activities is sought. At the same time, the student must carry out personal study work in order to make the most of the classes.

Compulsory laboratory practices are carried out, which are distributed throughout the semester and whose evaluation will form part of the final grade of the subject. Groups of two students are formed to work on each laboratory assembly and to carry out the practical preparatory work, not in person.

The autonomous work, studying the subject and applying it to the resolution of exercises, is fundamental in the learning process of the student and for the overcoming of the activities of evaluation.

The material for the development of the subject will be available in the virtual platform "Moodle" of the University of Zaragoza from which the student will be able to download the following documents:

- Presentation of the subject including contact details of the teachers, timetables for tutorials, teaching, practices and evaluation dates; qualification criteria for the different evaluation activities; description of the objectives and program of the subject as well as the most relevant bibliographical references.

- Transparency of the lectures (preparation of the assessment activities AE1, AE2, AE3, AE4 and AE5).

- Compilation of questions from the SA1 evaluation activity.

- Scripts of the practical sessions, descriptive guide of the laboratory instruments and tutorial of the simulation program, necessary for the AE1 and AE2 evaluation activities.

- Compilation of characteristics sheets of the main components of the practical sessions used in the SA2 evaluation activity.

- Compilation of theoretical-practical questions to support the AE3 evaluation activity.

- Compilation of problems supporting the SA4 evaluation activity.

- Compilation of previous course examinations, if any, with their solutions, in support of SA3 and SA4 activities.

4.2. Learning tasks

The course includes the following learning tasks:

1- Lectures (30 hours) (face-to-face)

In this activity, the fundamental contents of the subject are presented and it is carried out in the classroom in a face-to-face way.

2- Classroom practices (15 hours) (classroom)

In this activity application problems are solved in a participative way. Students are encouraged to solve the problems indicated by the teacher before the class.

3- Laboratory practices (15 hours) (classroom)

The laboratory practices in this subject have exceptionality of continuous evaluation, which implies the obligation of attendance and monitoring by the student. For this reason, the grade in this activity is transferred to the global tests with no possibility of recovery. The students have practice scripts provided in advance by the department, which contain a description of the assemblies and the guidelines for the development of the activity. In order to make the most of the session, it is necessary for the student to go to the laboratory class with the practice that is going to be done properly prepared. The laboratory is a scenario with which the first-year student is not familiar, and in which he must learn to maintain a necessary attitude of seriousness, prudence and observance.

4- Practical work (15 hours) (not in person)

These works, with preparatory cases of the contents of practical sessions, will be developed in an off-site way within the scope of the practice group.

5- Study and personal work (70 hours) (non-attendance)

It is very important that the student develops in a constant way, and distributed throughout the semester, personal work of study and resolution of problems.

6- Tutorials (face-to-face)

4.3. Syllabus

The course will address the following topics:

Theoretical contents:

The contents of the lectures correspond to the electronic fundamentals of the following thematic blocks:

Theme 1. Previous knowledge

Theme 2. Semiconductors. Diodes

Theme 3. BJT Transistor

Theme 4. FET Transistor

Theme 5. Differential stage

LABORATORY TRAINING PROGRAM AND PRACTICAL WORK:

1. Introduction to the Electronics Laboratory.

2. Input and output impedances. Audio amplifier I

3. Diodes and rectification

4. Audio amplifier II (amplifier stage with BJT)

5. Audio amplifier III. Audio amplifier IV. BJT in commutation

6. FET transistor. Audio amplifier V

4.4. Course planning and calendar

Master and problem classes and laboratory practice sessions are held according to a schedule established by the center and published prior to the course start date. Each teacher will initially inform and in the case of specific modifications, of his or her tutoring schedule. The rest of the activities will be planned according to the number of students and will be announced sufficiently in advance.

The subject is taught in the first semester of the second year of the degree.

The specific dates of the beginning and end of the classes, as well as the dates of the laboratory practices, delivery of work and exams, will be made public at the beginning of the course, according to the timetables set by the Centre.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30307