Universidad Zaragoza

Academic Year/course: 2021/22

30022 - Basic principles of electronics

Syllabus Information

Academic Year: 2021/22
Subject: 30022 - Fundamentos de electrónica
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 436 - Bachelor's Degree in Industrial Engineering Technology
ECTS: 6.0
Year: 3
Semester: First semester
Subject Type: Compulsory
Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

Learning process designed for this subject is based on the following principles:

Learning process is developed through three main levels: lectures, exercise solving and laboratory practices, with increasing participation from the student.

- In lectures, theoretical basis of electronic systems will be shown having several examples to illustrate them.

- In exercise solving sessions, several exercises will be explained and solved with student participation.

- Laboratory practical sessions, will be developed in small groups. The student will implement and test electronic circuits shown in the lectures and exercise sessions.

Materials for 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. Includes contact data for teachers, timetables of tutorials, classes, laboratory practices, and evaluation dates. It also will include evaluation criteria for the different learning activities; objective description and subject program, and the most relevant bibliographic references.

- Slides for the lectures

- Manuals for the laboratory sessions, and descriptive guide about instruments in the laboratory.

- Data sheet of main electronic components used in practices.

- Collection of small questions of theoretical/practical type to give support for evaluation preparation.

- Collection of exercises to be solved to give support to evaluation activity.

- Collection of exams of past courses with solutions

- Glossary of english terms

4.2. Learning tasks

The course includes 6 ECTS (150 hours) organized according to:

Lectures (30 hours) (classroom teaching)

This activity presents fundamental contents of the subject and is done in the classroom in face-to-face modality.

Practical learning activity in classroom (face to face activity) (15 hours)

In this activity, different exercises applying fundamental contents are solved in the classroom in a participative way. Students are encouraged to try and solve previously the exercises.

Examples of technologies developed in conjunction with the teachers of the Alborada special education school to support their students are shown, promoting a vision of technology at the service of human needs and well-being, and an attention to functional diversity and design centered on user as values of the design and use of technology.

Laboratory sessions (15 hours) (face-to-face activity)

Students have the practical exercises manual available in university server. They include a description of the circuits to be implemented and indications to develop the activity. In order to achieve and adequate effectiveness of this work, students must come to this classes with the practical exercise previously prepared.

At the beginning of the document that contains the scripts for the laboratory sessions, a series of assembly tips and work procedures are included, which remind the student of the main guidelines that they must follow to work, at all times, safely. Recommendations are included regarding:

- Instrumentation handling

-In the material available to the student, explanatory documents are included on the handling and operation of all the instruments available in the laboratory and that must be used at some point in the laboratory sessions.

-The safe sequence of connecting and disconnecting the instruments is described when they are to be used at the same time.

-The way to carry out measures in safe mode and how to interpret them to minimize any risk that may appear is detailed.

- Circuit assembly

-Recommendation to prepare a tentative 'layout' in advance to help carry out an assembly without failures and with a topology similar to that of the schematic that is supplied, all this to try to avoid failures that lead to possible overvoltages or overcurrents and, in in case the failure occurs to solve it as quickly as possible.

-Wiring usage tips, including color coding to aid in mounting fault detection.

-Advice on connection and identification of components to minimize errors and the potential risks of incorrect handling (electrolytic capacitors in session 2).

During the same performance of the laboratory practices (especially during session 2 in the description of transformers) the risk of electroshock posed by the handling of electricity is explained, factors that make it more or less dangerous such as the amplitude of the current and its frequency, and examples of equipment failures that could give rise to exposure and risk to it by forcing muscle contraction.

The safety measures of the laboratory, the differential circuit breaker, the thermal one and the grounding of the equipment and the circuits to be assembled are explained. In addition to the usefulness of earthing, the difficulties in terms of measurements, circuit operation and safety involved in modifying connections and connecting measuring probes are explained and shown.

Thus the student also acquires knowledge of electrical safety of domestic installations.

Autonomous work (85 hours) (non face-to-face)

This section includes the previous work required to prepare laboratory sessions.

It is very important that the student develops study and exercises resolution in a continuous way during the subject.

Regularly the student will get proposals of exercises to solve. Some of them will be solved in classroom classes.

Tutorials (face-to-face)

Teachers are available for tutorials with students in a specific timetable, so they can ask any doubts and questions about the subject.

Evaluation (5 hours) (face-to-face)

Moreover to determine the grades of evaluation, it is also a learning tool with which the student may test his/her own degree of comprehension and assimilation of the subject.

4.3. Syllabus

The course will address the following topics:

Theory sessions

Topic 1. Pre-requisites

Topic 2. Semiconductors. Diodes

Topic 3. Bipolar transistor

Topic 4. Unipolar transistor

Topic 5. Transistor based voltage and current sources

Topic 6. Transistor switching

Topic 7. Introduction to digital devices

Topic 8. Operational amplifier (OA)

Topic 9. OA based non-linear stages

Topic 10. Amplifiers

Topic 11. OA base linear stages

Topic 12. Non-ideal operational amplifier

Topic 13. Frequency response

Throughout the course, the efficiency of the use of energy of the technological solutions discussed is emphasized, calculating it in different circuit options and pointing out the most efficient ones. In this way, attention to more environmentally friendly technologies is promoted. The toxicity of some components and the need for their proper recycling are also discussed as attention to the environmental impact of our human activities.

Laboratory sessions

Session 1. Introduction to electronics laboratory

Session 2. Diodes. Linear power supply.

Session 3. Electronic control of the speed of a DC motor

Session 4. Digital electronics based PWM generator to control the speed of a DC motor

Session 5. Analog electronics based PWM generator to control the speed of a DC motor

Session 6. Audio Amplifier

4.4. Course planning and calendar

For further details concerning the timetable, classroom and further information regarding this course, please refer to the Escuela de Ingeniería y Arquitectura de la Universidad de Zaragoza (EINA), website, https://eina.unizar.es/.

4.5. Bibliography and recommended resources

Link:
http://biblos.unizar.es/br/br_citas.php?codigo=30022&year=2019