Universidad Zaragoza

Academic Year/course: 2022/23

30121 - Basic principles of electronics

Syllabus Information

Academic Year: 2022/23
Subject: 30121 - Basic principles of electronics
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
179 - Centro Universitario de la Defensa - Zaragoza
Degree: 425 - Bachelor's Degree in Industrial Organisational Engineering
563 - Bachelor's Degree in Industrial Organisational Engineering
ECTS: 6.0
Year: 3
Semester: First semester
Subject Type: Compulsory
Module:

1. General information

1.1. Aims of the course

The main goal of this subject is to give to the student the basic fundamentals of electronic technology. Therefore, one of the topics will be the study of digital and analog electronic components, how they work, how to design and which are the main uses of these devices. We also work in methodological issues to the analysis and design of simple electronic circuits with the help of simulation tools and lab instrumentation.

These approaches and objectives are in line with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (https://www.un.org/sustainabledevelopment/), in such a way that the acquisition of the course learning outcomes provides training and competence to contribute to their achievement to some degree:

Goal 7: Ensure access to affordable, reliable, sustainable and modern energy

And, in particular, within the target:

7.3 By 2030, double the global rate of improvement in energy efficiency

1.2. Context and importance of this course in the degree

Principles of electronics is a common subject in all the industrial engineering degrees and the knowledge of this subject is key to the engineering curriculum.

More specifically, this subject belongs to ordinary training unit to address, apart from generic competences, knowledge of fundamentals of electronics.

Specialization in defence: This subject contributes to the training of the army officers developing the ability to solve problems and take decisions with initiative, creativity and critical reasoning and giving knowledge about the principles and techniques of electronics, the technology which several devides used by army officers to performed their mission are based and so, developing their technology profile. In addition, it prepare students in the necessary competence to address the optative modules of radar systems and missiles and communication systems.

1.3. Recommendations to take this course

In order to be successful in this subject, the student should have taken or should be taking the subject of Electrical engineering, and it is recommended to have taken Physics and Chemistry.

2. Learning goals

2.1. Competences

General competences:

- Ability to solve problems and take decisions with initiative, creativity and critical reasoning.
- Ability to communicate knowledge and skills in Spanish.
- Ability to use techniques, skills and tools necessary to practise engineering.

Specific competences:

- Knowledge of the fundamentals of electronics.

2.2. Learning goals

1. Identifies the applications and functions of electronics in Engineering.
2. Recognises basic electronic components and devices used for the different electronic functions.
3. Uses basic techniques for analyses of analog and digital electronic circuits.
4. Is able to design analog and digital electronic circuits at block diagram level.
5. Manages the tools of a basic electronics laboratory and uses electronic simulation tools.

2.3. Importance of learning goals

When students reach the learning goals of this subject, they will be able to understand the fundamentals of how to work with several electronic devices and the equations that rule their behaviour, as well as, the basis of electronic instrumentation. Experimental practices in the laboratory are mandatory for engineering graduate students and they allow them to reinforce the theory with practical sessions.

For defence, this subject is the fundament for some optional modules.

3. Assessment (1st and 2nd call)

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

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1. Practical tasks (10%). These tasks include laboratory practices and problem-solving. At the beginning of each laboratory practice, the students should submit a preliminary study. Its quality will be considered in the evaluation since they are essential to perform the practices in an agile way. A final report should be submitted at the end of each practice. To pass the subject the student must obtain a final note in the laboratory practices equal to or greater than 5.
2. A theoretical-practical test (90%) in which some questions and/or problems of the engineering area are proposed to be solved. Its typology and complexity level will be similar to those questions and problems seen in class. The test will be evaluated in terms of the quality and clarity of the solving strategy, the concepts used to solve the problems, the absence of errors in the development and solution, and of the correct use of terminology and notation. In each of the theoretical and practically written tests, students must obtain a note equal to or greater than 5 to pass the subject.

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FIRST CALL

Continuous assessment:

The students will be able to pass the total of the subject by the continuous assessment procedure. To do this, they must demonstrate that they have achieved the expected learning outcomes by passing the assessment instruments indicated below, which will be carried out throughout the semester:

1. Exam. Consists of the assessment of multiple-choice questions and problem-solving questions. Topics 2 and 3. Its weight in the final grade is 17.5%.
2. Exam. Consists of the assessment of multiple-choice questions and problem-solving questions. Topics 4 and 5. Its weight in the final grade is 35%.
3. Exam. Consists of the assessment of multiple-choice questions and/or problem-solving questions. Topics 6 and 7. Its weight in the final grade is 17.5%.
4. Assessment during computer/lab sessions of the work carried out by the students. Its weight in the final grade is 15%.
5. Exam. Consists of the assessment of multiple-choice questions and/or problem-solving questions. Related to computer/lab sessions. Its weight in the final grade is 15%.

In the final mark of the continuous assessment (100%) all the assessment instruments carried out throughout the course and its weight will be taken into account. To pass the subject, the student?s final grade must be equal to or greater than 5.

Final Exam:

The students who do not pass the subject by continuous assessment or who would like to improve their grades, will have the right to take the final exam set in the academic calendar, prevailing, in any case, the best of both grades. This global assessment will be equivalent to the continuous assessment test described and will have the 100% weight in the final grade.

This final exam will consist of multiple-choice questions and problem-solving questions.To pass the subject, the student?s final grade must be equal to or greater than 5.

SECOND CALL

Final Exam:

The students who do not pass the subject in the first call may take the Final Exam set in the academic calendar for the second call. This Final Exam will consist of multiple-choice questions and problem-solving questions. To pass the subject, the student?s final grade must be equal to or greater than 5.

ASSESSMENT CRITERIA

Problem-solving questions: The quality and clarity of the resolution strategy, the correct application of the theoretical concepts, absence of errors in the development and in the solutions, and the correct use of terminology and notation will be taken into account.

Assessment during computer/lab sessions: The identification of the basic electronic components, the use of vocabulary adequate, the handling of the basic instrumentation and/or the electronic simulator, and the correct assembly and characterization of the proposed circuits.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The approach, methodology and assessment of this course is prepared to be equivalent in any teaching scenario. It will be adjusted to the socio-sanitary conditions of each moment, as well as to the indications given by the competent authorities.

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There is a strong interaction between teacher and student. This interaction is brought into being through a division of work and responsibilities between the students and the teacher. Nevertheless, it must be taken into account that, to a certain degree, students can set their learning pace based on their own needs and availability, following the guidelines set by the teacher.

The current subject Automatic Foundation is conceived as a stand-alone combination of contents, yet organized into three fundamental and complementary forms, which are: the theoretical concepts of each teaching unit, the solving of problems or resolution of questions and laboratory work, at the same time supported by other activities

The organization of teaching will be carried out using the following steps:

- **Lectures**: Theoretical activities are carried out mainly through exposition by the teacher, where the theoretical supports of the subject are displayed, highlighting the fundamentals, structuring them in topics and or sections, and interrelating them.
- **Practical Classes**: The teacher resolves practical problems or cases for demonstrative purposes. This type of teaching complements the theory shown in the lectures with practical aspects.
- **Laboratory Workshop**: The lecture group is divided up into various groups, according to the number of registered students, but never with more than 20 students, in order to make up smaller-sized groups.
- **Individual Tutorials**: Those carried out by giving individual, personalized attention to a teacher from the department. Said tutorials may be in person or online.

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The contents of the subject will be presented using an active methodology based on problem-based learning, consolidating the contents with self-assessed activities. The methodology of the self-assessed activities is designed for encouraging the autonomous work of the student. During lab sessions, students will learn to recognize the basic electronic compounds and devices and to handle the basic instrumentation. Electronic simulators will be also introduced to reinforce the techniques of analysis of electronic circuits.

4.2. Learning tasks

The course includes the following learning tasks:

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Involves the active participation of the student, in a way that the results achieved in the learning process are developed, not taking away from those already set out, the activities are the following:

Face-to-face generic activities:

- **Theory Classes**: The theoretical concepts of the subject are explained and illustrative examples are developed as a support to the theory when necessary.
- **Practice Sessions**: Problems and practical cases are carried out, complementary to the theoretical concepts studied.
- **Laboratory Workshop**: This work is tutored by a teacher, in groups of no more than 20 students.

Generic non-class activities:

- Study and understand the theory taught in the lectures.
- Understanding and assimilation of the problems and practical cases solved in the practical classes.
- Preparation of seminars, solutions to proposed problems, etc.
- Preparation of laboratory workshops, preparation of summaries and reports.
- Preparation of the written tests for continuous assessment and final exams.

The subject has 6 ECTS credits, which represents 150 hours of student work in the subject during the trimester, in other words, 10 hours per week for 15 weeks of class.

A summary of a weekly timetable guide can be seen in the following table. These figures are obtained from the subject file in the Accreditation Report of the degree, taking into account the level of experimentation considered for the said subject is moderate.

Activity	**Hours per week**
Lectures	3
Laboratory workshop	1
Other activities	6

Nevertheless, the previous table can be shown in greater detail, taking into account the following overall distribution:

- 44 hours of lectures, with 50% theoretical demonstration and 50% solving type problems.
- 12 hours of laboratory workshop, in 1 or 2-hour sessions.
- 4 hours of written assessment tests, one hour per test.
- 40 hours of teamwork divided up over the 15 weeks of the semester.
- 50 hours of personal study, divided up over the 15 weeks of the semester.

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Lectures will consist of the explanation of the contents by the teacher encouraging the involvement of students. Practice sessions will consist of problem resolution by applying the techniques of circuit analysis.

Computer/Lab sessions will be carried out in order to reinforce some theoretical contents explained in class. During lab sessions, the students will get familiar with basic electronic devices and the use of measurement instrumentation of an electronics laboratory. In computer sessions or as a complement for lab sessions, electronic simulators will be used for studying the behaviour of circuits to be implemented. Furthermore, that tools can be employed to facilitate the understanding of the behaviour of proposed circuits to the students.

Self-assessed activities will be proposed through the platform Moodle. Thus, students can carry out constant and autonomous work and teachers can visualize the performance of students.

The slides and a collection of problems for each lesson, besides the material related to the lab sessions, circuit simulator, etc., will be available at Moodle (https://moodle2.unizar.es/add/). This platform will be also used to deliver and evaluate the proposed activities along the course. Finally, students can apply individual tutorials to the teachers through the platform YouCanBookMe https://youcanbook.me/.

4.3. Syllabus

The course will address the following topics:

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- Introduction
- The Transistor
- Operational amplifiers
- Combinational systems
- Sequential systems

A detailed guide will be available at the beginning of the course in ADD: http://moodle2.unizar.es/add.

Materials

The different teaching materials will be provided in ADD: http://moodle2.unizar.es/add.

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The content of the course is divided into the following Topics:

Topic 1. Introduction to Electronics

Topic 2. Semiconductors

Topic 3. Diodes

Topic 4. Transistors

Topic 5. Operational amplifier

Topic 6. Fundamentals of digital electronics

Topic 7. Digital systems

4.4. Course planning and calendar

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Class hall sessions & work presentations timetable will be found in https://moodle2.unizar.es/add/

The dates of the final exams will be those that are officially published at http://www.eupla.es/secretaria/academica/examenes.html.

The written assessment tests will be related to the following topics:

- **Test 1**: Topic 1, 2, 3
- **Test 2**: Topic 4, 5

At the end of every topic, the student can find some reinforce exercises in order to guide him in their personal homework.

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The course?s content is distributed in approximately 4 hours per week of classroom activities, which include lectures, practice sessions and computer/lab sesssions, and 6 hours per week of non-contact activities, including self-study and carrying out the self-assessed activities and the required training before the computer/lab sessions.

Lectures, practice sessions and computer/lab sesssions timetable, as well as the official dates for exams, are established by the University Centre for the Defence and published in the website: cud.unizar.es.

4.5. Bibliography and recommended resources

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Bibliography available here: http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30121