Universidad Zaragoza

Academic Year/course: 2022/23

28820 - Electronic Technology II

Syllabus Information

Academic Year: 2022/23
Subject: 28820 - Electronic Technology II
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 424 - Bachelor's Degree in Mechatronic Engineering
ECTS: 6.0
Year: 3
Semester: First semester
Subject Type: Compulsory
Module:

1. General information

1.1. Aims of the course

The general objective of the course is to provide the necessary knowledge to interpret and solve digital electronic circuits, especially in the areas of combinational circuits and sequential circuits.

This requires the correct use of the most common computer applications for simulation of circuits and of the measuring and feeding instruments commonly used in the electronics laboratory and correctly interpreting the technical documentation of the components used. The learning of specific software for the design and simulation of digital electronic circuits will be promoted.

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/es/), 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 9: Industries, Innovation and Infrastructure

Indicators that the objectives have been achieved it, will be: the ability to interpret plans of commercial electronic equipment and applications and the ability to make electronic schemes according to the appropriate regulations and symbols, and finally, the preparation of technical reports on the practical activities carried out.

1.2. Context and importance of this course in the degree

The subject of Electronic Technology II is part of the Mechatronic Engineering Degree taught by EUPLA, framed within the group of subjects that make up the module called Electricity and Electronics. It is a subject of the third course located in the fifth semester and a mandatory character (MC), with a teaching load of 6 ECTS credits.

It is part of the subject Electronic Technology that has six associated subjects, all of them of 6 ECTS credits, of which this is the second one that is proposed in the temporal sequence of the curriculum, its content is focused on Digital Electronics.

It has the subject of Electronics Technology I, also mandatory (MC), which is taught in the fourth semester focused on Analog Electronics, both form the convenient electronic basis to successfully face the set of subjects that give continuity to training electronic courses that are taken in the sixth semester: Programmable Electronic Systems, Power Electronics and Electronic Instrumentation.

In addition, the offer of training in Electronic Technology is completed with an optional subject (OP) called Advanced Instrumentation of the eighth semester.

1.3. Recommendations to take this course

The development of the subject of Electronic Technology II requires putting into play knowledge and strategies, coming from subjects corresponding to the previous courses and semesters of the Degree in Mechatronic Engineering, related to:

Mathematics, Physics, Chemistry, Technical Drawing, Computer Science, Electrical Engineering and Electronic Technology I.

2. Learning goals

2.1. Competences

As generic and specific competence, the student will acquire:

- Knowledge of the fundamentals of electronics (EI05).
- Interpret and solve analog electronic circuits that use operational amplifiers (EE02 and EE04).
- Interpret and solve power supply circuits, adjusting their characteristics to the needs of the application where they are used (EE02 and EE04).
- GI03: Knowledge in basic and technological subjects that enable you to learn new methods and theories, and provide you with the versatility to adapt to new situations.
- GI04: Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.
- GI06: Capacity to handle mandatory specifications, regulations and standards.
- GC02: Interpret experimental data, contrast it with the theoretical and draw conclusions.
- GC03: Capacity for abstraction and logical reasoning.
- GC04: Ability to learn continuously.
- GC05: Capacity to evaluate alternatives.
- GC06: Capacity to adapt to the rapid evolution of technologies.
- GC07: Ability to lead a team as well as being an active member of it.
- GC08: Ability to locate technical information, as well as its understanding and assessment.
- GC09: Positive attitude towards technological innovations.
- GC10: Ability to write technical documentation and to present it with the help of appropriate computer tools.
- GC11: Ability to communicate their reasoning and designs clearly to specialized and non-specialized audiences.
- GC14: Ability to understand the operation and develop the maintenance of mechanical, electrical and electronic equipment and installations.
- GC15: Ability to analyze and apply simplified models to technological equipment and applications that allow forecasting of their behaviour.
- GC16: Ability to configure, simulate, build and test prototypes of electronic and mechanical systems.
- GC17: Capacity for the correct interpretation of plans and technical documentation.

2.2. Learning goals

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

- Explain the behaviour of digital electronic devices (combinational and sequential), applying fundamental principles and logical laws, using vocabulary, symbols and appropriate forms of expression.
- Analyze the operation of typical electronic circuits, which use digital functions, describing their operation by truth tables, operation tables, input-output waveforms and transfer functions.
- Select and correctly use the components of a digital electronic circuit, both in combinational and sequential applications, detailing its function in the block where they are used.
- Analyze and interpret diagrams and plans of applications and electronic equipment of digital technology, including the function of an element or functional group of elements in the set, based on existing regulations.
- Select and interpret adequate information to raise and evaluate solutions to common technical needs and problems in the field of Digital Electronics, with a level of precision consistent with the various magnitudes involved in them.
- Choose and properly use the typical measuring devices in the Electronic Laboratory, assessing its field of application and degree of precision.
- Know how to use the general methodology and the appropriate software tools to work on applied Digital Electronics.

- Know the use of specific software for the design and simulation of digital electronic systems.

2.3. Importance of learning goals

Being the third subject that is taught in the module of Electricity and Electronics, and that complements the subject Electronic Technology I, (taught in the course and previous semester) centred that in Analogic Electronics, is complemented in this new subject with Electronics Digital.

Achieve good results in learning, will assume a base level for the student, which will facilitate the study of the other subjects of this module that are taught in semesters and/or later courses, especially in Power Electronics, Electronic Instrumentation and Systems Programmable Electronics.

Applying the descriptive methods of truth tables, state maps and timelines to the digital schemes analyzed, correctly using the main magnitudes and electrical units, are essential in the professional practice of the Engineer, for which the ability to interpret technical documentation is also required: data sheets of electronic devices, device manuals, regulations, regulations, etc.

Analyze and solve both combinational and sequential circuits are essential elements in the knowledge of Digital Electronics and necessary for any development in the field of Mechatronics, which must be made clear by knowing how to select the most suitable components and functions for the design of circuits of digital applications.

Know the management of the main electrical measuring devices: voltmeter, ammeter, ohmmeter, wattmeter, oscilloscope, etc. used in the electronics laboratory, as well as the logical analyzers and acquire manual dexterity in practical assemblies, will allow the student to consolidate the concepts taught in this subject as well as in the others that make up the Electricity and Electronics module.

3. Assessment (1st and 2nd call)

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

The student must demonstrate that they have achieved the expected learning outcomes through the following assessment activities

The course is divided into two thematic blocks, which will be evaluated as follows:

1. Laboratory practices (30%): In each of the practices, the dynamics followed for its correct execution and operation will be assessed, as well as the problems raised in its development, with the specific weight of this section being 30% of the total mark of the practice. The remaining 70% will be dedicated to the qualification of the memory presented, that is, if the required data is correct and the questions raised have been answered correctly. The quality of the analysis that the students carry out of the results obtained in the laboratory, will be assessed through a final report of each of the practices. To pass the subject, in each of the blocks, students must obtain a final grade of laboratory practices equal to or greater than 4.
2. Theoretical-practical written tests (70%) in which questions and/or problems in the field of engineering of similar complexity to that used during the course will be raised. The quality and clarity of the resolution strategy, the concepts used to solve the problems, the absence of errors in the development and in the solutions, and the correct use of terminology and notation will be valued. In each of the theoretical-practical written tests that are carried out, students must obtain a grade equal to or greater than 4 to pass the subject.

The final grade will be the average of the grades obtained in each of the blocks. **NOTE = (Block1)·50%+ (Block2)·50%**

The student will be able to choose between a continuous evaluation, carried out in the form of two written tests and the delivery of the practice scripts throughout the semester, or a global test carried out at the end of the semester corresponding to the written tests and/or a global test. corresponding to laboratory practices.

It is an essential condition to pass the subject in continuous evaluation, to attend 80% of the face-to-face activities: classes, technical visits, practices, etc.

In general, the grades obtained in each of the blocks may be promoted to the next call(s) within the same academic year, provided that a grade equal to or greater than 4 points has been achieved.

On the first day of class, there will be a presentation of the subject where the evaluation models will be explained.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The learning process that has been designed for this subject is based on the following:

The teaching methodology is based on a strong teacher / student-a interaction. This interaction is materialized through a distribution of work and responsibilities between students and teachers. However, it must be considered that to a certain extent the students will be able to set their learning pace according to their needs and availability, following the guidelines set by the teacher.

The approach, methodology and assessment of this guide are intended to be the same for any teaching scenarios. They will be adapted to the social-health situation at any particular time, as well as to the instructions given by the authorities concerned.

4.2. Learning tasks

The program offered to the student to help him achieve the expected results includes the following activities:

- Face-to-face activities:
    - Theoretical classes: The theoretical concepts of the subject will be explained and practical examples will be developed.
    - Classes of problems: The teacher solves problems or practical cases for illustrative purposes. This type of teaching complements the theory presented in the lectures with practical aspects. On the other hand,
    - Tutored problem solving: Students will develop examples and carry out problems or practical cases related to the theoretical concepts studied.
    - Laboratory Practices: The total group of theoretical classes may or may not be divided into smaller groups, as appropriate. The students will carry out montages, measurements, simulations, etc. in the laboratories in the presence of the practical teacher.
    - Autonomous activities tutored: These activities will be tutored by the teaching staff of the subject.
    - Reinforcement activities: Through a virtual teaching portal (Moodle) various activities will be conducted that reinforce the basic contents of the subject. Its realization will be controlled through it.
- Non-contact activities:
    - Study and assimilation of the theory presented in the lectures.
    - Understanding and assimilation of problems and practical cases solved in practical classes.
    - Preparation of seminars, resolution of proposed problems, etc.
    - Preparation of the laboratory practices, elaboration of the scripts and corresponding reports.
    - Preparation of the written tests of continuous evaluation, and global evaluation test.

- Organization of teaching:
    - Lectures: Theoretical and / or practical activities taught primarily by the lecturer.
    - Laboratory practices: practical activities carried out in the laboratories. The total group of lectures may or may not be divided into smaller groups, as appropriate. Students will be guided by the teacher's tutorial action.
    - Group tutorials: scheduled activities to monitor learning in which the teacher meets with a group of students to guide their autonomous learning and supervisory tasks for supervised work or that require a very high degree of advice from the teacher.
    - Individual tutorials: These are those carried out through personalized attention, individually, they may be face-to-face or virtual.

The subject consists of 6 ECTS credits, which represents 150 hours of student work on the subject during the semester. 40% of this work (60 h.) Will be done in the classroom, and the rest will be autonomous. A semester will consist of 15 school weeks.

Global temporal distribution:

The course consists of 6 ECTS credits, which represents 150 hours of student work on the subject during the semester, that is, 10 hours per week during 15 school weeks, which are distributed as follows:

- **44 hours of theoretical class:** 50% presentation of concepts and 50% resolution of standard problems, at a rate of 4 hours per week, except in the weeks of practices or the weeks with a control test, which will be reduced by two hours.
- **12 hours of tutored laboratory practice:** weeks 1 to 15 sessions of 2 hours in alternate weeks.
- **4 hours of control tests** (2 controls of 2 hours), which will be carried out (approximately) in the 8th and 15th weeks.
- **30 hours of group work:** spread over the 15 weeks of the semester.
- **60 hours of personal study:** at a rate of 4 hours in each of the 15 weeks of the semester, to prepare work, do exercises, study theory, etc...

A teaching week temporal distribution:

Subject is defined in the Bachelor's Degree Verification Report with a low experimental grade, so the 10 hours per week are distributed as follows:

- **Theoretical-practical classes:** 3 hours per week
- **Laboratory practices:** 1 hour per week
- **Other activities:** 6 hours a week

4.3. Syllabus

The theoretical contents are divided into three blocks (numbers 1 to 2) preceded by a block 0 of introduction to Digital Electronic Technology. The choice of the content of the blocks has been made looking for the express clarification of the final objective, so that with the union of incidental knowledge, the student obtains a structured knowledge, easily assimilated for the Mechatronics Engineers.

Each of the blocks is composed of topics, on a weekly basis, one per course week approximately. These topics include the contents necessary for the acquisition of predetermined learning outcomes.

Theoretical contents

Block 0:INTRODUCTION: DIGITAL TECHNIQUES

Block 1:INTRODUCTION TO DIGITAL TECHNIQUES

1.- Basic elements of digital technology and Integrated Circuits

2.- Combinational Logical Design Methods

3.- Combinational Logical Circuits (Encoders and Decoders, Multiplexers and Demultiplexers, and other Combinational Functions)

Block 2: ANALYSIS AND DESIGN OF SEQUENTIAL LOGIC CIRCUITS

4.- Basic and synchronized bistables

5.- Digital Counters and Digital Records

6.- P.L.D and A.S.I.C. Matrix architectures /Semiconductor memories

Practical Contents

Each block exposed in the previous section has associated practical exercises in this regard, through practical assumptions and / or physical or simulated assembly work, leading to obtaining results and their analysis and interpretation.

As the topics develop, these Practices will be proposed, preferably in class and also through the Moodle platform, they will be carried out by the students in weekly sessions of one hour, during the time dedicated to each Block.

4.4. Course planning and calendar

Calendar of face-to-face sessions and presentation of work

The calendar of the face-to-face classes of theory and problems, as well as the computer practical sessions, will have the schedule established by the EUPLA, which can be consulted on its website.

Each teacher will inform about their tutoring schedules.

The dates of the final exams will be those published officially at https://eupla.unizar.es/asuntos-academicos/examenes. The final calendar of the corresponding academic year can be seen on the website of the educational center https://eupla.unizar.es/.

The class schedules, as well as the distribution of groups for practices will be transmitted to the students by the teacher at the beginning of the academic year, it will be published on the Moodle platform as well as on the website of the university center (http://www.eupla.es/).

The dates of other activities: (evaluative tests, seminars, compulsory practices, delivery of work ...) will be published in advance by the teacher both in class and through the Moodle platform.

Testing schedule

For the evaluation tests, described in the continuous evaluation process, the following approximate schedule is proposed:

- Test 1: Topics 1, 2 and 3 (Week 8)
- Test 2: Topics 4, 5 and 6 (Week 15)

The weekly schedule of the subject will be published at http://www.eupla.es/

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=28820