Universidad Zaragoza

Academic Year/course: 2022/23

29919 - Fundamentals of electronics

Syllabus Information

Academic Year: 2022/23
Subject: 29919 - Fundamentals of electronics
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 435 - Bachelor's Degree in Chemical 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 this subject is to provide students with basic knowledge of analogue, digital and power electronics, as well as to introduce them to the usual terminology and enable them to analyse simple electronic circuits.

The learning process is articulated from the need or scenario to the solution or device. First, scenarios are presented in which the involvement of a system based on electronic devices is required. Next, the most representative electronic systems that cover the previously stated requirements are identified. Then the most common electronic devices are presented, studying their principle of operation. Systems based on the explained electronic devices that cover the initially stated requirements are then designed.

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.

Target 7.2 By 2030, increase significantly the share of renewable energy in the energy mix.

1.2. Context and importance of this course in the degree

The subject covers the training requirement in the subject Fundamentals of Electronics contained in the Compulsory Industrial Branch Module of the Degree in Chemical Engineering. This degree qualifies for the profession of Chemical Engineer.

Nowadays, the efficient management of many machines, motors and industrial installations, and the monitoring and control of processes requires the use of electronics. With Power Electronics it is possible to control motors and automatisms, while Analogue Electronics and Digital Electronics make it possible to capture sensor data, analyse the information and make management decisions quickly and accurately, thus controlling the work of actuators in processes. In this respect, it is a subject related to the third and fourth year subjects "Experimentation in Chemical Engineering I and II" and "Control of Chemical Processes" in the fourth year. The subject Fundamentals of Electronics allows students to acquire the necessary skills to integrate electronic systems in the world of Chemical Engineering.

1.3. Recommendations to take this course

It is recommended that the student has taken "Fundamentals of Electrical Engineering" in the second year and "Fundamentals of Computer Science" in the first year.

2. Learning goals

2.1. Competences

Generic competences

C04 - Ability to solve problems and make decisions with initiative, creativity and critical reasoning.

C06 - Ability to communicate and transmit knowledge, skills and abilities in Spanish.

C07 - Ability to use the techniques, skills and tools necessary for the practice of engineering.

Specific competences

C22 - Knowledge of the fundamentals of electronics.

2.2. Learning goals

1.Identifies the applications and functions of electronics in engineering.

2.Recognises the basic electronic components and devices used for different electronic functions.

3.Knows how to use the basic techniques for the analysis of analogue, digital and power electronic circuits.

4.Has the aptitude to design analogue, digital and power electronic circuits at block level.

5.Handles the instruments typical of a basic electronics laboratory and uses electronic simulation tools.

2.3. Importance of learning goals

Knowledge and understanding of Electronics is important for the exercise of part of the competences of a graduate in Chemical Engineering, so the skills acquired in this subject will be very useful for their training.

In a society in which electronics has become an omnipresent technology, the concepts explained in this subject will allow the student to begin to understand the technological bases and the functioning of the multiple electronic devices that surround us.

Experimental training in the laboratory is irreplaceable for graduates in Chemical Engineering and allows them to bring theoretical approaches closer to the reality of experimental set-ups.

The subject "Fundamentals of Electronics" lays the necessary foundations to successfully undertake subjects related to automatisms and the control of machines and processes.

3. Assessment (1st and 2nd call)

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

- Itinerary 1: Continuous Assessment

Laboratory practicals (20%)

These will be graded by assessing the students' work in the laboratory (ability to assemble and commission the circuits and systems), and the previous studies prepared by the students. Learning outcomes 2, 4 and 5 are achieved through this activity.

Grading CL from 0 to 10 points, it will represent 20% of the student's overall grade. In order to pass the course, the student must complete all the programmed practicals and obtain a minimum grade of 4 points.

In the case of not having done any laboratory practicals, the mark for the practical part can never be higher than 3.5 points.

Continuous assessment activities (30%)

In order to encourage continuous work, evaluable activities will be carried out throughout the semester. The specific activities to be carried out will be communicated in class. Through this activity, learning outcomes 1, 2, 3 and 4 will be achieved.

CE grade from 0 to 10 points, representing 30% of the overall grade.

The minimum mark for this part to be taken into account will be 4 points. Otherwise, option (1) will be applied.

Theoretical-practical exam (50%)

Composed of theoretical-practical questions and problems, to be taken on official dates. The correctness of the answers, developments, designs and numerical results will be assessed. Learning outcomes 1, 2, 3 and 4 are achieved through this activity.

CT qualification from 0 to 10 points. It will represent 50% of the student's overall grade (or 80% if he/she did not pass the continuous assessment activities (1)). The minimum mark for this part, necessary to pass the subject, will be 3 points.

- Itinerary 2: Global Assessment

In the two official exams, the global evaluation of the student will be carried out. On both dates the following tests will be carried out:

Theoretical-practical exam: CT grade from 0 to 10 points. It will account for 75% of the overall grade, and a minimum grade of 3 points will be required for this part.
Laboratory exam: CL grade from 0 to 10 points. It will account for 25% of the overall grade. The exam will consist of the implementation of circuits and systems similar to those developed during the course in the practical laboratory sessions. The design methodology, the operation of the circuit or system and the handling of the instruments, development tools and laboratory equipment will be assessed. The minimum mark for this part, which is necessary to pass the course, will be 4

points.
If the minimum marks indicated above are not achieved, both in the theoretical-practical exam and in the laboratory practical, or in the laboratory exam, if applicable, the overall mark for the exam will never be higher than 4.5 points.

*The course is passed with a minimum overall grade of 5 points out of 10.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The learningprocess will be developed on two main levels: theory and problems classes and laboratory. The student's level of participation will increase as he/she assumes the basics of the subject.

- In the theory and problems classes, the theoretical bases of electronics will be presented, focusing the student on practical cases linked as far as possible to their speciality.
- The simulation work that may be proposed has a double purpose: to optimally establish the theoretical concepts and to prepare the laboratory sessions.
- Laboratory practices will be developed in small groups, where the student will assemble and check the operation of electronic circuits and systems previously studied in class. The practical sessions will be oriented towards the implementation of a complete electronic system of industrial application, that is to say, the student will develop a complete electronic system of industrial application in the last session.

The material for the development of the subject will be available in the moodle platform of the subject, from where the student will be able to download the following documents:

- Presentation of the subject including: contact details of the lecturers, tutoring, teaching and practical schedules; grading criteria for the different assessment activities; description of the objectives and programme of the subject, as well as the most relevant bibliographical references.
- Transparencies of the lectures.
- Scripts of the practical laboratory sessions.
- Compilation of problems to support the evaluation activity.

4.2. Learning tasks

Master classes (30 hours)

The contents are approached through the presentation of the functions that electronics performs in the field of engineering in general and chemical engineering in particular, in a path articulated around an application project that will be developed in the practicals. Electronic devices and systems are introduced as they appear in the project.

Practicals (15 hours)

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.

Laboratory practice (15 hours)

The electronics laboratory is a setting with which the student is not familiar, and in which he/she must learn to maintain the necessary attitude of seriousness, prudence and observance. In order to carry out the laboratory practicals in this subject, the students are provided with practice scripts provided in advance by the department. These scripts contain a description of the set-ups and the guidelines, objectives and specifications for the development of the activity.

Students will be required to come to the laboratory class with the practical they are going to do duly prepared and with the previous work specifically indicated in the script correctly done. This previous work must be handed in, as well as the report elaborated during the development of the practical, following the indications of the script in order to be part of the evaluation process.

Practical work (30 hours)

This work refers to the preparation of the practical sessions and the continuous assessment activities. The specific activities to be carried out will be communicated in class and on the subject's moodle platform.

Study and personal work (55 hours)

It is very important that the student develops constantly, and distributed throughout the semester, personal work of study and problem solving.

Tutorials

Students who wish to do so may go to the lecturer to ask questions about the subject. For this purpose, the student has a tutorial timetable.

Assessment (5 hours)

In addition to the grading function, assessment is also a learning tool with which the student checks the degree of understanding and assimilation of the subject.

4.3. Syllabus

The course will address the following topics:

THEORETICAL PROGRAMME

Block 0. Introduction. Generalities, instrumentation and simulation

Block 1. Devices and basic functions.

Block 2. Analogue: Sensing and conditioning.

Block 3. Digital: Control and visualisation.

Block 4. Regulated power: Power supplies.

Block 5. Switching power: Power control.

PRACTICAL PROGRAMME

P1) Laboratory instrumentation.

P2) Laboratory instrumentation. + temperature sensor.

P3) Introduction to Arduino.

P4) Microcontroller based control and display system.

P5) Power supply.

P6) Arduino project.

4.4. Course planning and calendar

Lectures, problem classes and practical sessions in the laboratory are taught according to the timetable established by the centre and published prior to the start date of the course.

Each lecturer will inform initially, and in case of specific modifications, of their tutoring timetable.

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 third year of the degree.

The specific dates for the beginning and end of classes, as well as the dates for the laboratory practicals, assignments 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://biblos.unizar.es/br/br_citas.php?codigo=29919&year=2019