Universidad Zaragoza

Year : 2019/20

28812 - Electrical Engineering

Syllabus Information

Academic Year: 2019/20
Subject: 28812 - Electrical Engineering
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 424 - Bachelor's Degree in Mechatronic Engineering
ECTS: 6.0
Year: 2
Semester: First semester
Subject Type: Compulsory
Module: ---

1.General information

1.1.Aims of the course

The subject and its results respond to the following approaches and objectives:
Show the basic concepts of the theory of electrical circuits and the study of the different types of circuits resulting, the results in the analysis of networks, according to the nature of the power supply. If the source is invariable in time, the circuits of the direct current are studied, while the sinusoidal constant current alternating current circuits are studied in the sinusoidal.

The following general objectives of the subject are:

- Have the students practice the analytical techniques developed in the subject.
- Show students that analytical techniques are tools, not objectives in themselves.
- Allow students to practice in the choice of the most appropriate analytical method to obtain a specific solution.
- Show students how the results of a solution can be used to find other information about the operation of a circuit.
- Encourage students to check the solutions, as well as an alternative method or checking if the solution makes sense according to the known behaviour of the circuit.
- Make students begin to become familiar with design-oriented problems.
- Having students practice in the deduction and handling of the equations in the magnitudes of interest are expressed as functions of circuit variables such as R, L, C, etc .; These types of problems also serve to support the design process.
- Show the general principles of electric machines. Introduce in the knowledge of electric machines.

1.2.Context and importance of this course in the degree

The Electrical Engineering course is part of the Degree in Mechatronic Engineering taught by EUPLA, framed within the group of subjects that make up the module called Electricity and Electronics. It is a subject of the second year of compulsory education (OB), with a teaching load of 6 ECTS credits. This subject involves a more than the discrete impact on the acquisition of the skills of the degree, in addition to providing additional useful training in the performance of the functions of the Mechatronic Engineer related to the field of electricity.

The need for the subject within the curriculum of the present degree is more than justified and it is understood that the ideal would be that, as a student, this subject will be started with clear ideas about what an electric circuit is, what components it has, as well as the physics that lies behind it, that is, the theory of electric and magnetic fields, previous knowledge acquired in previous studies.

1.3.Recommendations to take this course

The development of the Electrical Engineering subject requires putting into play knowledge and strategies from subjects related to:

· Technical drawing: Graphic resources, expression techniques and the use of standard lines are an essential tool to express technical ideas. The views, the perspective images, the plans and the circuit diagrams are documents commonly used in Electrotechnics.

· Physics: Knowledge of the laws and regulatory principles of physical phenomena allows us to understand the functioning of the devices and systems that are the object of study in Electrotechnics.

· Mathematics: The accomplishment of all the calculations that are carried out in Electrotechnics needs algorithms and calculation strategies that come from these subjects.

This subject does not possess any normative prerequisite nor does it require specific complementary knowledge. Therefore,

the above is understood from a formal point of view, although it is necessary to be clear that an adequate training base is needed in the disciplines previously indicated.

The study and continued work, from the first day of the course, are fundamental to overcome with the maximum advantage of the subject.

It is important to resolve any doubts that may arise as soon as possible, for which the student has the advice of the teacher, both during the classes and in the hours of tutoring intended for it.

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

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

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

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

Strong interaction between the teacher/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, Electric Engineering, 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:

· **Theory Classes.** Theoretical activities carried out mainly through exposition by the teacher, where the theoretical supports of the subject are displayed, highlighting the fundamental, structuring them in topics and or sections, 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 giving individual, personalized attention of the teacher. Said tutorials may be in person or online.

4.2.Learning tasks

The course 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**:

? **Lectures**: The theoretical concepts of the subject are explained and illustrative examples are developed as 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 understanding of 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	**Weekly school hours**

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:

? 45 hours of lectures, with 50% theoretical demonstration and 50% solving type problems.

? 11 hours of laboratory workshop, in 1 or 2-hour sessions.

? 4 hours of written assessment tests, two hours per test.

? 4 hours of PPT presentations.

? 34 hours of exercises and tutorial work, divided up over the 15 weeks of the 1st semester.

? 50 hours of personal study, divided up over the 15 weeks of the 1st semester.

4.3.Syllabus

The course is structured around two complementary components: theoretical and practical. The concepts and fundamentals of electrical circuit analysis, illustrated with actual examples, will be presented. Student participation through questions and brief discussions will be encouraged.

The contents of the theoretical classes are the following:

Topic I: Basic concepts.

- Introduction and definitions.
- Components of a network.
- Ideal generators.
- Fundamental properties.
- Notation and references.
- Basic analysis techniques.

Topic II: Techniques of circuit analysis.

- Divider circuits.
- Basic element connections.
- Other connections.
- Equivalence between sources.
- Thévenin and Norton equivalents.
- Other circuit theorems.

Topic III: Analysis of elementary networks in the time domain.

- Introduction and considerations.
- Sinusoidal signal: representation.
- Concept of the phasor.
- Phasor relations for R, L and C.
- Kirchhoff: frequency domain.
- Impedance: phasor relationships.

Topic IV: An introduction to three-phase systems.

- Single-phase and 3-phase networks.
- Star-triangle relationships.
- Voltage, current, power.

Topic V: Analysis of elementary networks in the time domain.

- Introduction, simple RL circuit.
- Properties of the exponential response.
- General RL circuit.
- Simple RC circuit.
- General RC circuit.
- RLC parallel circuit (unsourced).
- RLC series circuit (unsourced).

- The complete response of an RLC circuit.
- Circuit analysis using the Laplace Transform.

Topic VI: Fundamental principles of electrical machines.

- Introduction.
- Basics of electrical machines.
- Types of electrical machines. General classification.
- Main characteristics of electrical machines.
- Performance and loss of electrical machines.
- Electromotive force induced in the windings.
- Electromagnetic torque.

4.4.Course planning and calendar

Schedule sessions and presentation of works

Lectures and problem resolution classes and laboratory workshops are according to the schedule set by the centre, which must be published before the start date of classes (http://www.eupla.es/).

The teacher will inform about his hours of tutoring.

Other activities will be planned depending on the number of students and will be announced with time. It will be available on https://moodle.unizar.es/

4.5.Bibliography and recommended resources

http://biblos.unizar.es/br/br_citas.php?codigo=28812&year=2019