

Academic Year: ( 2020 / 2021 )

Review date: 10-07-2020

Department assigned to the subject: Electrical Engineering Department

Coordinating teacher: ARNALTES GOMEZ, SANTIAGO

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

**REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)**

Calculus I  
 Calculus II  
 Linear Algebra  
 Physics II

**OBJECTIVES**

By the end of this subject, students will be able to have:

1. A systematic understanding of the key aspects and concepts of electrical engineering;
2. Awareness of the wider multidisciplinary context of engineering.
3. The ability to apply their knowledge and understanding to identify, formulate and solve electrical engineering problems using established methods;
4. The ability to design and conduct appropriate experiments, interpret the data and draw conclusions;
5. Workshop and laboratory skills.
6. The ability to combine theory and practice to solve electrical engineering problems.

**DESCRIPTION OF CONTENTS: PROGRAMME**

1. Electrical circuits
  - 1.1 Electrical variables and units
  - 1.2. Topological definitions
  - 1.3. Kirchhoff's laws
  - 1.4. Circuit elements: resistor, inductor, capacitor and sources.
2. Analysis of DC circuits.
  - 2.1. Parallel and series connections
  - 2.2. Mesh method
  - 2.3. Node method
  - 2.5. Thévenin's theorem
  - 2.3. Superposition principle.
3. Analysis of AC circuits.
  - 3.1. Sinusoidal waves and phasors.
  - 3.2. Impedance.
  - 3.3. Circuit analysis in the frequency domain.
  - 3.5. Power in AC circuits.
4. Analysis of three phase circuits.
  - 4.1. Structure of a three phase system.
  - 4.2. Phase and line magnitudes.
  - 4.3. Single-phase equivalent circuit.
  - 4.4. Three phase power and reactive compensation.

Laboratory sessions about current, voltage and power measurements in DC, AC circuits and three phase systems.

## LEARNING ACTIVITIES AND METHODOLOGY

- On-line magistral classes for the exposition of the subject content.
- Classes in smaller groups for the resolution of circuit analysis exercises.
- Individual tutoring for solving student doubts.
- On-line tutoring for collective groups.
- Student individual work with proposed exercises.
- Laboratory sessions for mounting an electrical circuit and measuring.

## ASSESSMENT SYSTEM

Laboratory sessions:

Lab sessions will be on-line. Attendance to laboratory session is mandatory to pass the subject in ordinary call. The lab marking will take into consideration the answers to questions in the lab scripts. In order to face the lab sessions, it is mandatory to answer some proposed questions in the practice guide.

In the extraordinary call, those students who didn't attend laboratory sessions will have to pass a laboratory exam, where they will have to perform the a complete simulation of a practical circuit.

Ordinary call:

The final exam will weight 50% in the final marking. This final exam will consist of several exercises, whose relative weights will be notified the day of the exam.

The continuous assessment will weight 50% in the final marking. The continuous assesment is performed in the class groups during the semester. It consists of three partial exams, corresponding to each part of the subject: DC circuits, AC circuits and three phase systems. Generally, each part will have the same weight in the continuous assessment.

Extraordinary call:

- a. If the student followed the continuous assessment, the final exam will have the same weight than in the ordinary call.
  - b. If the student did not follow the continuous assessment, the final exam marking in the extraordinary call will be the final marking of the subject.
- Nevertheless, to pass the subject, the student will need to have passed the laboratory practices or pass a final laboratory practice exam in the extraordinary call.

<b>% end-of-term-examination:</b>	60
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	40

## BASIC BIBLIOGRAPHY

- Carlson, A. Bruce Teoría de Circuitos, Thomson.
- Fraile Mora, Jesús Electromagnetismo y circuitos eléctricos, McGraw-Hill.
- Guillermo Robles Problemas resueltos de fundamentos de ingeniería eléctrica, Paraninfo, 2015
- Usaola, Julio y Moreno, M<sup>a</sup>. Ángeles Circuitos eléctricos. Problemas y ejercicios resueltos, Pearson Educación.

## ADDITIONAL BIBLIOGRAPHY

- Conejo Navarro, Antonio Circuitos eléctricos para la Ingeniería, McGraw-Hill.
- F. Barrero Sistemas de Energía Eléctrica, Editorial Thomson.
- Guirado R., Asensi R., Jurado F., Carpio J Tecnología Eléctrica, Mc Graw Hill.
- Gómez Expósito, Antonio, et al. Teoría de Circuitos. Ejercicios de autoevaluación, Thomson.