

Academic Year: ( 2022 / 2023 )

Review date: 31/05/2022 14:44:06

Department assigned to the subject: Electrical Engineering Department

Coordinating teacher: CASTRONUOVO , EDGARDO DANIEL

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 1

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

Electrical Engineering Fundamentals.

## OBJECTIVES

- To identify the main technical components of the electricity sector.
- To analyze the characteristic of transmission lines in ac and dc.
- To specify the effects of a short circuit in the electrical system.
- To design simple circuits with electrical wires.
- To compose both switching and protection equipments in an electrical network.

## DESCRIPTION OF CONTENTS: PROGRAMME

Dear Student:

This course reviews the main components of the electrical system. We study how electricity is generated, as it is transported around the country, the way how it is distributed in the cities, the design of commercial, industrial and home installations and some characteristics of the energy demand. Also, we analyze how the system detects and reacts to short circuits.

Six thematic groups can be summarized:

1. The electricity system, with a characterization of its main components.
  - 1.1. Power system structure: generation, transmission and distribution.
  - 1.2. The generation mix in Spain.
  - 1.3. Main characteristics of transmission and distribution grids.
  - 1.4. Load estimation.
  - 1.5. Per unit calculation.
2. Overhead transmission lines.
  - 2.1. Physical configuration of overhead transmission lines.
  - 2.2. Characteristics and models for ac and dc transmission lines.
3. Analysis of symmetrical short circuits.
  - 3.1. Types of short circuits.
  - 3.2. Symmetrical Short circuit calculations.
4. Planning of electric systems with insulated conductors.
  - 4.1. Selection criteria for insulated cables.
  - 4.2. Approximate calculation of voltage drops in short lines.
  - 4.3. Maximum current criterion in short circuit and normal situations.
5. Switchgears: switching and measurements.
  - 5.1. Switchgears characterization.
  - 5.2. Switching connections in electric substations.

- 6. Protections in the electric system.
- 6.1. Protection elements and structures in electric grids.
- 6.2. Fuses and relays selection.

In the course, three lab's activities are executed.

## LEARNING ACTIVITIES AND METHODOLOGY

In the course, introductory topics are presented, typical problems are solved and laboratory classes are followed. The problems are solved jointly between students and teacher, interactively. Laboratory lectures reinforce contents and skills of the students, allowing them interacting with electrical elements in a real form.

## ASSESSMENT SYSTEM

<b>% end-of-term-examination/test:</b>	0
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	100

The evaluation of the subject may be done through a continuous evaluation scheme or a final exam.

1) In the continuous evaluation process:

During the course there will be five partial sessions consisting of theory questions and problems in each of the five parts of the subject:

- \* Introduction. machines, transformers, demand.
- \* Unit magnitudes.
- \* Lines and shorts
- \* Selection of drivers
- \* Switchgear and Protections

The course may be approved exclusively by continuous assessment. In this sense, all students who have taken the five intermediate tests with a minimum score of 2 points in each of them, and have obtained a score equal to or greater than 5 points out of 10 in the calculation of the average grade, will be exempted from taking the final exam. The final mark for the continuous assessment will be made up of 85% of the average mark of the partial exams, and 15% of the laboratory mark.

**IMPORTANT:** Laboratory activities are mandatory, in any evaluation case.

2) In the evaluation process by FINAL EXAM:

a) In the ordinary call

- A final exam (maximum mark = 60% of the total mark) consisting of theory questions and problems of the subject so that the entire syllabus of the subject is covered.

b) In the extraordinary call

- A final exam (100% of the total mark) consisting of the numerical resolution of the subject's problems so that the entire syllabus of the subject is covered.

c) **IMPORTANT:** Laboratory activities are mandatory, in any evaluation case.

## BASIC BIBLIOGRAPHY

- M.E. El-Hawary Introduction to Electrical Power Systems, John Wiley & Sons, 2008
- N. Mohan First course on Power Systems, MNPERE, 2006

## ADDITIONAL BIBLIOGRAPHY

- P. Montané Protecciones en las instalaciones eléctricas, evolución y perspectivas, P. Montané, 1991

