Electrical Technology

Academic Year: (2023 / 2024) **Review date: 06/09/2023 12:37:56**

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.

LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study
CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CG1. 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.
CG3. Ability to design a system, component or process in the field of Industrial Technologies to meet the required specifications
RA1. Knowledge and understanding: Have basic knowledge and understanding of science, mathematics and engineering within the industrial field, as well as knowledge and understanding of Mechanics, Solid and Structural Mechanics, Thermal Engineering, Fluid Mechanics, Production Systems, Electronics and Automation, Industrial Organisation and Electrical Engineering.
RA2. Engineering Analysis: To be able to identify engineering problems within the industrial field, recognise specifications, establish different resolution methods and select the most appropriate one for their solution
RA4. Research and Innovation: To be able to use appropriate methods to carry out research and make innovative contributions in the field of Industrial Engineering.
RA5. Engineering Applications: To be able to apply their knowledge and understanding to solve problems and design devices or processes in the field of industrial engineering in accordance with criteria of cost, quality, safety, efficiency and respect for the environment.

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

% end-of-term-examination/test:	0
% of continuous assessment (assigments, laboratory, practicals…):	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 four midterm exams consisting of theory questions and problems of the parts of the subject.

The course may be passed exclusively by continuous assessment. In this sense, all students who have taken the four midterm exams with a minimum score of 2 points in each of them, and have obtained a mark 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 midterm 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

% end-of-term-examination/test:	0
% of continuous assessment (assigments, laboratory, practicals…):	100

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