

Academic Year: (2022 / 2023)

Review date: 20-06-2022

Department assigned to the subject: Department of Electrical Engineering

Coordinating teacher: GARCIA DE BURGOS, MARIA BELEN

Type: Electives ECTS Credits : 6.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Physics II

Electrical Power Engineering Fundamentals

OBJECTIVES

Design capability of electromagnetic components. Ability to analyze the operation of a transformer in different practical circumstances. Capability of carrying out tests to determine parameters. Basic knowledge of national and international regulations. Determination of the interactions of the transformer with the rest of the electrical system. Ability to choose a transformer for a specific application.

All of the above can be summarized in the following Learning Outcome:

Explain and justify the operation of single-phase, three-phase and measuring power transformers and their role in electrical transmission networks of energy

DESCRIPTION OF CONTENTS: PROGRAMME

Topic 1: REVIEWING BASIC CONCEPTS ON ELECTRICITY AND MAGNETISM. Maxwell equations. Core losses. Dielectric losses. Magnetic circuits. Self and mutual inductances.

Topic 2: CONSTITUTION OF POWER TRANSFORMERS. Magnetic core, windings, insulation system. Transformer refrigeration. Basic concepts on maintenance.

Topic 3: 1-PHASE TRANSFORMERS. No load performance. On-load performance. Overloads. Equivalent circuit. Efficiency. Voltage drop. Parallel operation. Short circuit currents. Inrush current.

Topic 4: 3-PHASE TRANSFORMERS. Types of transformers. Phasor groups. No-load performance. Transformer performance under balanced and un-balanced loads. Zero-sequence impedance. Tertiary windings. Interconnected star windings. Three winding transformers. Autotransformers. Tap changers. Application of the different transformer types and phasor groups.

LEARNING ACTIVITIES AND METHODOLOGY

The learning methodology includes:

- Lectures covering the main topics described within the course outline.
- Case study and problem solving lectures, where some issues are addressed from a practical point of view.
- Laboratory sessions

ASSESSMENT SYSTEM

One writing exercise for each topic of the subject. With a score upper than 5.0 the exercise is passed. Those students with one or various failed exercises must perform a final exam of those failed exercises.

% end-of-term-examination: 60

% of continuous assessment (assignments, laboratory, practicals...): 40

BASIC BIBLIOGRAPHY

- Kulkarni, S.V.; Khaparde S.A. Transformer engineering. Design and Practice, Marcel Dekker, 2012

BASIC ELECTRONIC RESOURCES

- Juan Carlos Burgos . OCW Circuitos Magnéticos y Transformadores: <http://ocw.uc3m.es/ingenieria-electrica/circuitos-magneticos-y-transformadores>

