

Rotating electrical machines

Academic Year: (2019 / 2020)

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Department assigned to the subject:

Coordinating teacher: SANZ FEITO, JAVIER

Type: Electives ECTS Credits : 6.0

Year : 4 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Electrical Engineering Fundamentals (2nd year), Machine Mechanics (1st year), Tecnología Eléctrica (3º curso), Transferencia de Calor (3º curso).

It is highly advisable to take this course along with the elective course "Principles of Electromechanical Energy Conversion" that is offered during the same year and semester, for those students willing to drill into the theoretical aspects of the electrical machines.

OBJECTIVES

This subject focus on operation and applications of rotating electrical machines (ac), ranging from their common general issues to those related with industrial operation and practical applications design.

After completing the course, the student should be acquainted with the most usual methods for the sizing and design of industrial applications involving electromechanical energy converters, along with the determination of their performance, and the selection of the different electrical machines for any specified operating conditions, based upon Standards and the available technical-economical literature.

DESCRIPTION OF CONTENTS: PROGRAMME

1. The issue of electrical drives.
 - 1.1 General conditions for the mechanical equilibrium in steady-state
 - 1.2 Types of mechanical loads: torque-speed characteristics
2. General aspects of electrical machines
 - 2.1 Structure of rotating electrical machines
 - 2.2 Construction and common technical aspects
 - 2.3 Standardization (Construction, cooling, and protection types and codes, insulation thermal classes)
 - 2.4 Service classes and service factor
3. Dc motors.
 - 3.1 Construction
 - 3.2 Operating characteristics
 - 3.3 Speed regulation in dc motors.
4. The induction motor.
 - 4.1 Operating characteristics
 - 4.2 Starting methods and speed regulation
 - 4.3 Operation of induction motors at constant frequency.
5. Selection criteria and sizing procedure for industrial drives at constant frequency.
 - 5.1 Heating and cooling curves: thermal time constant
 - 5.2 Influence of service class. Thermal derating
 - 5.3 Influence of starting frequency
6. Variable frequency speed regulation.

6.1 Technological aspects of variable frequency drives.

6.2 Selection criteria and sizing procedure for variable-speed induction motor drives.

LEARNING ACTIVITIES AND METHODOLOGY

Due to the elective nature of this course, the limitation in the students number allowed to choose it and its intrinsic practical orientation, all learning activities will be project-oriented, based on student's work. The students should develop during the course several mini-projects and assignments under the teacher's supervision. In parallel. Lectures will be organized to present the design method and best professional practices in the design of electromechanical facilities.

The classes will be completed with some sessions where the students should make a presentation about their different mini-projects, followed by an open discussion of the whole group about the pros and cons of each design. These sessions will be moderated by the teacher.

Some sessions will adopt a job shop structure, where students are assumed to work out their assignments and develop their calculations under the instructor supervision.

ASSESSMENT SYSTEM

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

The course assessment is only based on continuous assessment, including the different mini-projects developed by the students, the oral presentations made in the classroom and their attitude and contributions to the debates and discussions.

BASIC BIBLIOGRAPHY

- FRAILE MORA, J Máquinas Eléctricas, McGraw-Hill, 2008
- SANZ FEITO, J Máquinas Eléctricas, Prentice Hall, 2002