

Course Unit	Electrical Machines	Field of study	Physics/Chemistry
Bachelor in	Renewable Energy Engineering	School	School of Technology and Management
Academic Year	2023/2024	Year of study	2
Type	Semestral	Semester	2
Workload (hours)	162	Contact hours	T 30 TP - PL 30 TC - S - E - OT - O -
Level	1-2	ECTS credits	6.0
Code	9910-743-2203-00-23		

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s) Susana Sofia Alves Freitas, Ângela Paula Barbosa da Silva Ferreira

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:

1. describe the operation of various types of electrical machines;
2. understand and interpret the operating characteristics of static and rotating electrical machines;
3. select and proceed to dimensioning of electrical machines within their applications.

Prerequisites

Before the course unit the learner is expected to be able to:

1. use complex numbers;
2. analyse single and three phase AC electrical circuits.

Course contents

Basic operating principles of static and rotating electrical machines (electromagnetic induction and rotating magnetic field). Losses and efficiency of energy conversion processes. Operating characteristics of transformers and induction machines. Selection and dimensioning of electrical machines.

Course contents (extended version)

1. Introduction to static and rotating electric machinery fundamentals
 - The electromagnetic induction
 - The rotating magnetic field concept
2. Losses, efficiency, power and torque
3. Electrical transformers
 - Operating characteristics
 - Selection and dimensioning of single-phase, three-phase and transformers banks
 - Instrument transformers
4. Three-phase induction machines
 - Operating characteristics
 - Speed control
 - Selection and dimensioning of three-phase induction motors

Recommended reading

1. S. J. Chapman, Electric Machinery Fundamentals, 5th Ed. , McGraw Hill, 2011.
2. S. L. Herman, Electrical Transformers and Rotating Machines, 4th Ed. , Cengage Learning, 2016
3. J. F. Gieras, Electrical Machines, Fundamentals of Electromechanical Energy Conversion, CRC Press, 2020.
4. I. Boldea, Reluctance Synchronous Machines and Drives, Oxford University Press, 1996.

Teaching and learning methods

Implementation of practical and laboratory work involving electrical machines within the scope of Project-Based Learning according to what is contained in the guiding document of the course's integrative project.

Assessment methods

1. Distributed assessment - (Regular, Student Worker) (Final)
 - Practical Work - 40%
 - Final Written Exam - 60% ((It is required a minimum classification of 25%.))
2. Global assessment - (Regular, Student Worker) (Supplementary, Special)
 - Final Written Exam - 100%

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

Ângela Paula Barbosa da Silva Ferreira, Susana Sofia Alves Freitas	José Luís Sousa de Magalhaes Lima	Ana Maria Alves Queiroz da Silva	José Carlos Rufino Amaro
29-02-2024	06-03-2024	11-03-2024	16-03-2024