

SUBJECT TEACHING GUIDE

G862 - Electrical Machines I

Degree in Electrical Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Electrical Engineering			Type and Year	Compulsory. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Electrical Machines Module in Common with the Industrial Branch				
Course unit title and code	G862 - Electrical Machines I				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ELECTRICA Y ENERGETICA				
Name of lecturer	CRISTIAN OLMO SALAS				
E-mail	cristian.olmo@unican.es				
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Other lecturers	FERNANDO DELGADO SAN ROMAN				

3.1 LEARNING OUTCOMES
- Identify the different types of electrical machines and their elements.
- Select the tools and parameters suitable for the analysis of an electrical machine.
- Calculate the basic quantities of an electrical machine regime.

4. OBJECTIVES

- Establish and interpret of electrical machines electromagnetic fundamentals.
- Knowledge of the material constitution and different types of electrical machine functional elements.
- Knowledge and selection of tools for the analysis of electrical machines.
- Knowledge of the operating characteristics for different types of electrical machines.

6. SUBJECT PROGRAM

CONTENTS

1	General principles of electrical machines.
1.1	Magnetic circuits and losses.
1.2	Electrical machines constitution.
1.3	Basic operating principles of electrical machines.
1.4	Losses and efficiency. Current density. Heat generation and dissipation. Insulation. Specifications. Name plate.
2	Transformers.
2.1	Description and operating principle. Main dimensions.
2.2	Methods of analysis. Equivalent circuit.
3	Asynchronous or induction machines.
3.1	Description and operating principle.
3.2	Methods of analysis.
3.3	Power flow. Torque. Torque curve.
3.4	One-phase induction motor. Another asynchronous machines.
4	Synchronous machines.
4.1	Description and operating principle. No load operation.
4.2	Lineal and non-lineal analysis. Armature reaction. Parameters. Two reactions theory.
4.3	Isolated synchronous ac generator.
4.4	Another motors and generators: claw pole generator, variable reluctance motor, stepper motors,...
5	Direct current machines
5.1	Description and operating principle. Conmutator. Windings.
5.2	Basic quantities. Induced e.m.f.s. Electromagnetic torque.
5.3	Armature reaction. Commutation. Auxiliar windings.
5.4	Types of direct current machines.

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Laboratory practices.	Laboratory evaluation	Yes	No	10,00
Partial written exams of theory concepts.	Written exam	Yes	Yes	40,00
Final exam.	Written exam	Yes	Yes	40,00
Numerical simulation practices	Activity evaluation with Virtual Media	Yes	No	10,00
TOTAL				100,00
Observations				
<p>The course grade is divided in four parts: Software Simulations, Theory, Problems and Laboratory.</p> <p>There are two partial written exams of Theory during the course . Moreover, two final exams (two passing opportunities), each one divided in two parts: Theory and Problems. The Theory part in final exams is not subdivided , so it includes all the theory of the course.</p> <p>The Final Grade of Theory is the arithmetic mean of the grades obtained in the partial written exams (all partial exams have the same weight in this mean calculation) or the grade of the part of theory in one of the final exams.</p> <p>The Final Grade of Problems is equal to the grade obtained in the part of problems in one of the final exams.</p> <p>When a student obtains a Theory Grade (equal to the mean of partial exams or, if applicable, to the grade of the a theory part of a final exam) not lower than 4.0 (out of 10.0), no further theoretical examination is needed during the course. Similarly for the grade obtained in the Problems part of the final exams.</p> <p>The Final Grade of the Course is equal to the sum of 10% of the Simulations Grade plus the 10% of the Laboratory Grade plus 40% of the Final Grade of Theory and plus 40% of the Final Grade of Problems, unless the grade of one of these last two parts is less than 4.0. In this case, the Final Grade is the lowest value between the previous calculation result and 4.9.</p> <p>To pass the course a student must obtain a Final Grade higher or equal than 5.0 (out of 10.0) and both, the Final Grade of Theory and the Final Grade of Problems, must be not lower than 4.0 (out of 10.0).</p>				
Observations for part-time students				
Part-time students will be assessed on the same basis as full-time students.				

8. BIBLIOGRAPHY AND TEACHING MATERIALS
BASIC
FRAILE MORA, J. "Electromagnetismo y circuitos eléctricos". Mc Graw-Hill/Interamericana de España. Madrid.
FRAILE MORA, J. "Máquinas Eléctricas". Mc Graw-Hill/Interamericana de España. Madrid.
FRAILE MORA, J. "Problemas de máquinas eléctricas". Mc Graw-Hill/Interamericana de España. Madrid.
GUIONES DE CLASE Y DE PRÁCTICAS DE LABORATORIO. Miguel Angel Rodríguez Pozueta. (OCW de la Universidad de Cantabria).