

## SUBJECT TEACHING GUIDE

### G868 - Electrical Machines II

#### Degree in Electrical Engineering First Degree in Electrical Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Electrical Engineering First Degree in Electrical Engineering			Type and Year	Compulsory. Year 3 Compulsory. Year 3
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Further Electrical Machines Further Module in Common with the Industrial Branch				
Course unit title and code	G868 - Electrical Machines II				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ELECTRICA Y ENERGETICA				
Name of lecturer	FERNANDO DELGADO SAN ROMAN				
E-mail	fernando.delgado@unican.es				
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO PROFESOR (S2030)				
Other lecturers	CRISTIAN OLMO SALAS JAIME PEREDO ARGOS				

### 3.1 LEARNING OUTCOMES

- Compare the advantages and disadvantages of different electrical machines in an industrial application , and identify strengths and weaknesses of each option.
- Selecting and sizing the electric machine suitable for an industrial application.
- Identify and solve common problems in the industrial use of electrical machines.

**4. OBJECTIVES**

Examining common operational situations in the industrial use of electrical machinery.
Acquire the knowledge and skills to resolve normal issues in industrial operation of this equipment.

**6. SUBJECT PROGRAM**

CONTENTS	
1	Transformers.
1.1	Three-phase transformers.
1.2	Transient states of transformers.
1.3	Parallel connection of transformers.
1.4	Instrument transformers. Protection transformers.
2	Direct current machine behaviour.
2.1	Direct current motors and generators.
2.2	Direct current machines operations.
2.3	Basics of speed regulation.
3	Synchronous generator in a network.
3.1	Synchronous machine connected to infinite bus. Synchronous motor and generator.
3.2	Parallel operation of synchronous generators.
3.3	Shortcircuits. Pendular oscillations.
4	Asynchronous machine behaviour.
4.1	Double cage motors. Nema and IEC classification.
4.2	Asynchronous machine operations. Standards.
4.3	Basics of speed regulation.
4.4	Doubly-fed asynchronous machine.

7. ASSESSMENT METHODS AND CRITERIA				
Description	Type	Final Eval.	Reassessn	%
Laboratory examination	Laboratory evaluation	Yes	No	10,00
Partial written exams of theory.	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. 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. The same happens 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.. "Problemas de máquinas eléctricas". Mc Graw-Hill/Interamericana de España. Madrid.
GUIONES DE CLASE Y DE PRÁCTICAS DE LABORATORIO. Miguel Angel Rodríguez Pozueta.
FRAILE MORA, J.. "Máquinas Eléctricas". Mc Graw-Hill/Interamericana de España. Madrid.