



## IDENTIFYING DATA

### Electrical machines

Subject	Electrical machines			
Code	V12G363V01605			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language				
Department				
Coordinator	Novo Ramos, Bernardino			
Lecturers	Novo Ramos, Bernardino			
E-mail	bnovo@uvigo.es			
Web				
General description				

## Skills

Code

## Learning outcomes

Expected results from this subject Training and Learning Results

## Contents

Topic

UNIT I: INTRODUCTION TO THE ELECTRICAL MACHINES	<p>I-1 Electromagnetic and electro-mechanic fundamental laws. General behaviour notes: Physical arrangement of the electrical machines. Types of machines. Losses. Energy balance. Efficiency. Heating. Cooling. Rated power. Insulation types. Degrees of mechanical protection and construction types. Nameplate.</p> <p>I-2 Usual construction: Magnetic poles. Windings.</p> <p>I-3 M.M.F's and E.M.F's inside the machine: Fields generated with concentrated and distributed windings. Rotating magnetic field. Winding factor</p>
UNIT II: INDUCTION MOTORS (ASYNCHRONOUS)	<p>II-1 Three-phase induction machine Construction characteristics. Operating principles. Electrical equivalent circuit. Powers and torques. Electrical tests. Energy balance and efficiency. T-s curve. Operation modes. Starting methods and speed control.</p> <p>AC motor protection and control switchgear. Security oriented control circuits Security oriented protection schemes</p> <p>II-2 Single-phase induction motor Construction characteristics. Operating principles. Electrical equivalent circuit. Starting methods.</p>
UNIT III: SYNCHRONOUS MACHINES (GENERATORS)	<p>UNIT III: SYNCHRONOUS MACHINES (GENERATORS) Construction characteristics. Operating principles. Armature reaction. Salient poles and cylindrical rotor machines. Electrical equivalent circuit. Stand-alone and grid-connected behaviours. Synchronous motor: Characteristics and uses.</p>

UNIT IV: D.C. MOTORS. SPECIAL MACHINES

IV-1 Classic D.C. motor: Construction characteristics. Operating principles. Excitation systems. Armature reaction. Commutation. Speed control. Nameplate information.

IV-2 Special machines: BLDC, Stepper Motors.

**Planning**

	Class hours	Hours outside the classroom	Total hours
Problem solving	8	16	24
Laboratory practical	10	16	26
Lecturing	32.5	65	97.5
Objective questions exam	1	0	1
Problem and/or exercise solving	1.5	0	1.5

\*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

**Methodologies**

	Description
Problem solving	Student will be required to work in groups to solve and present some proposed ac machines problems.  This activity could be done using the "virtual office" if presentiality is not posibile due to the COVID19 University self-quarantine polilcies
Laboratory practical	Typical lab session in the Electrical Machines laoratory. They can be done online ( iusing some machine simulation software ) if presentiality is not posibile due to the COVID19 University self-quarantine polilcies  During these lessons students will apply the theoretical knowledge provided during the theory lessons, and at the same time they will learn how to protect themselves, other people and the machines against ANY possible electrical hazzard. Active and Passive Security will be taught and followed in these hours
Lecturing	Typical lecture. Either presential or using the "virtual office" facility. The place will depend on the COVID19 University self-quarantine polilcies

**Personalized assistance**

Methodologies	Description
Lecturing	Course-related discussions, asking for extra help, seeking clarification of material presented in class and following up on aspects of the class you find compelling can be done during the "Office Hours". They can be presential or "virtual". The student should ask the lecturer ( e-mail ) in order to decide the day and the time
Problem solving	Course-related discussions, asking for extra help, seeking clarification of material presented in class and following up on aspects of the class you find compelling can be done during the "Office Hours". They can be presential or "virtual". The student should ask the lecturer ( e-mail ) in order to decide the day and the time

**Assessment**

	Description	Qualification Training and Learning Results
Problem solving	The assessment method will be a numerical resolution of some exercises of electrical machines A minimum mark of 40% will be required in this part  Part of this qualification percentage could be obtained with some continuous evaluation, depending on the lecturer. (5/40). Student will be properly informed if this option is activated.	40
Lecturing	The assessment method will be a test, to be done individually without the use of any information source. There will be one unique test for the whole subject, and it will cover not only the theoretical lessons but the practical lab tests. A minimum mark of 40% will be required in this part  Part of this qualification percentage could be obtained with some continuous evaluation in the lab lessons, depending on the lecturer. (10/60). Student will be properly informed if this option is activated.	60

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**Other comments on the Evaluation**

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To pass the subject a minimum of 5/10 will be required (result of the sum of the 2 parts)

If the student final mark is bigger than 5, but the minimum in each part is not reached, the overall given mark will be 4.0 (FAILED)

Commitment: An student ethical behaviour is expected. If a non-ethical behaviour is detected (copying, cheating in any way, using unlicensed electronic devices, and others), it will be considered that the student does not gather the necessary requirements to pass the subject. In case of some unethical behaviour the mark will be 0.0 (FAILED) The COVID19 University policies can modify the final exam type, if we have to move to a "virtual exam". Any change will be announced properly so the students can adapt their learning processes to the new situation

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**Sources of information**

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**Basic Bibliography**

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**Complementary Bibliography**

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B. Novo, **Class notes**,

Any ac machines book,

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**Recommendations**

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**Subjects that are recommended to be taken simultaneously**

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Automation and control fundamentals/V12G363V01304

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**Subjects that it is recommended to have taken before**

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Physics: Physics 1/V12G363V01102

Physics: Physics 2/V12G363V01202

Basics of circuit analysis and electrical machines/V12G363V01302

Applied electrotechnics/V12G363V01501

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