Universida_{de}Vigo

IDENTIFYING DATA
Basics of circuit analysis and electrical machines

Subject	Basics of circuit analysis and electrical machines			
Code	V12G363V01302			
Study programme	Degree in Industrial Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language	English			
Department				
Coordinator	González Estévez, Emilio José Antonio			
Lecturers	González Estévez, Emilio José Antonio Vilachá Pérez, Carlos Villanueva Torres, Daniel			
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General description	--			

Competencies

Code	
B3	CG3 Knowledge in basic and technological subjects that will enable them to learn new methods and theories, and equip them with versatility to adapt to new situations.
C10	CE10 Knowledge and use of the principles of circuit theory and electrical machines.
D2	CT2 Problems resolution.
D6	CT6 Application of computer science in the field of study.
D10	CT10 Self learning and work.
D14	CT14 Creativity.
D17	CT17 Working as a team.

Learning outcomes

Expected results from this subject	Training and Learning Results		
Comprise the basic appearances of the operation of the circuits and the electrical machines	B3	C10	D10 D17
Know the experimental process used when it works with electrical circuits and scheme electrical		C10	
Know the available current technicians for the analysis of electrical circuits	B3		D2 D6
Know the technicians of measure of the electrical circuits		C10	D2 D17
Purchase skills on the process of analysis of electrical circuits	B3		D2 D14

Contents

Topic	
SUBJECT 1. INTRODUCTION And AXIOMS	1.1 Magnitudes and units. 1.2 References of polarity. 1.3 Concept of electrical circuit. 1.4 Axioms of Kirchhoff.

SUBJECT 2. ANALYSIS OF LINEAR CIRCUITS RESISTIVES	2.1 Ideal Elements: definition, representation and mathematical model.
	2.2 Models of real sources.
	2.3 Equivalent Dipoles: conversion of sources.
	2.4 Association of resistors: concept of voltage divider and current divider.
	2.5 Association of sources and resistors.
	2.6 Topological Concepts: knot, branch, bow and mesh.
	2.7 Number and election of circular and nodal equations linearly independent.
	2.8 Analyses by meshes and knots of circuits with resistors.
	2.9 Topological Transformations.
	2.10 Power and energy in resistors, ideal sources and real sources.
	2.11 Fundamental theorems.
SUBJECT 3. ANALYSIS OF CIRCUITS WITH ELEMENTS THAT STORE ENERGY	3.1 ideal Condenser: definition, representation and mathematical model.
	3.2 magnetic Circuits: units, magnetic flow, strength magnetomotive and reluctance.
	3.3 ideal Coil: definition, representation and mathematical model.
	3.4 Association series and parallel of coils and capacitors.
	3.5 Circuits with elements that store energy. Circuits RL, RC and RLC.
SUBJECT 4. ANALYSIS OF CIRCUITS IN SINUSOIDAL STEADY-STATE REGIME	4.1 Forms of periodic wave and values associated: sinusoidal wave.
	4.2 Determination of the sinusoidal steady-state regime.
	4.3 Response of the basic passive elements to sinusoidal excitations: concept of impedance and complex admittance.
	4.4 Law of Ohm and axioms of Kirchhoff in sinusoidal steady-state regime.
	4.5 Association of elements.
	4.6 Analyses by knots and by meshes of circuits in sinusoidal steady-state regime.
	4.7 Power and energy in sinusoidal steady-state regime. Instantaneous power, half or active power and energy in the passive elements: coils, capacitors, resistances and complex impedances.
	4.8 Power and energy in the dipoles. Apparent power, reactive power and complex power.
	4.9 Theorem of conservation of the complex power (theorem of Boucherot).
	4.10 The power factor and his importance in the electrical systems. Correction of the power factor.
	4.11 Measurement of the active and reactive power: wattmeters and varmeters.
	4.12 Fundamental Theorems in sinusoidal steady-state regime.
SUBJECT 5: MAGNETIC ADJUSTMENTS	5.1 Magnetic joined up coils: definitions, equations of flows, own and mutual inductances. Representations and mathematical models.
	5.2 Analyses by meshes of circuits of alternating current with coils joined up.
SUBJECT 6: BALANCED THREE-PHASE SYSTEMS	6.1 Introduction. Three-phase voltage system. Sequence of phases.
	6.2 Generators and three-phase loads: star and triangle connections. Voltages and currents.
	6.3 Equivalent transformations star-triangle.
	6.4 Analyses of balanced three-phase systems. Equivalent single-phase circuit.
	6.5 Power in balanced three-phase systems. Compensation of the power factor.
SUBJECT 7. ELECTRICAL MACHINES	7.1 Transformer and autotransformers.
	7.2 Rotational electrical machines: synchronous machine, asynchronous machine and DC machines.
PRACTICES	1. Use of lab equipments.
	2. Measures in resistive circuits.
	3. Introduction to the analysis and simulation of circuits by means of Matlab.
	4. Determination of a linear model of a real coil with core of air. Real coil with core of iron. Cycle of magnetic hysteresis.
	5. Simulation of transient regime by means of Matlab.
	6. Measures of active and reactive power in monophase systems. Compensation of the power factor.

Planning

	Class hours	Hours outside the classroom	Total hours
Laboratory practical	18	9	27
Problem solving	10	10	20

Autonomous problem solving	0	23	23
Lecturing	22	44	66
Essay questions exam	4	0	4
Report of practices, practicum and external practices	0	10	10

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

Methodologies

	Description
Laboratory practical	It will be performed circuit assembly corresponding to the knowledges acquired in class of theory, or it will be seen in the laboratory complementary aspects not treated in the theoretical classes.
Problem solving	It will solved type problems and exercises in class of big groups and the student will have to solve similar exercises.
Autonomous problem solving	The student will have to solve on his own a series of exercises and questions of the matter proposed by the professor.
Lecturing	The professor will explain in the classes of big groups the contents of the matter.

Personalized assistance

Methodologies	Description
Laboratory practical	The professor will attend personally the doubts and queries of the students during the tutorial hours.
Problem solving	The professor will attend personally the doubts and queries of the students during the tutorial hours.

Assessment

	Description	Qualification	Training and Learning Results
Essay questions exam	They will realise a 'written final exam' that will cover the full contents of the subject.	80	B3 C10 D2 D10 D14
Report of practices, practicum and external practices	It will be valued positively the realisation of a memory of each one of the practices of laboratory that will include: objectives, procedure followed, materials employed, results obtained and interpretation of them. The realisation of practices and the presentation of the memories are part of the process of continuous evaluation of the student. However, the students that have not realised the practices along the course, or wish to improve the mark obtained, will be able to opt to realise an additional written exam with questions regarding the development of the practices and to the educational contents explained during them. The value of this exam is the 20% of the final mark, in the same way as the continuous evaluation.	20	C10 D2 D6 D10 D14 D17

Other comments on the Evaluation

For the second opportunity of June-July it is kept the qualification in the continuous evaluation obtained during the own course, without prejudice that, to the equal that at the earliest opportunity of December - January,can be surpassed by the realisation of the written exam additional that is proposed to this effect.

Each new enrolment in the subject supposes to put a zero the qualifications in the activities of continuous evaluation obtained in previous courses.

Ethical commitment:

It expects that the student presents a suitable ethical behaviour. In the case to detect a no ethical behaviour (copy, plagiarism,utilisation of unauthorised electronic devices, for example) it will be considered the student does not gather the necessary requirements to surpass the matter. In this case the global qualification in the present academic course will be of suspense (0.0).

It will not be allowed the utilisation of any electronic device during the proofs of evaluation except with explicit permission. The fact to enter an unauthorised electronic device in the classroom of examination will be considered reason of no surpass the matter in the current academic course and the global qualification will be of suspense (0.0).

Responsible professor: DANIEL VILLANUEVA TORRES

Sources of information
Basic Bibliography

A. Bruce Carson, **Teoría de Circuitos**, Thomson Editores, S.A., 2001

A. Pastor, J. Ortega, V. Parra y A. Pérez, **Circuitos Eléctricos**, Universidad Nacional de Educación a Distancia., 2003

Suarez Creo, J. y Miranda Blanco, B.N., **Máquinas Eléctricas. Funcionamiento en régimen permanente**, 4ª, Editorial Tórculo., 2006

Jesus Fraile Mora, **Circuitos eléctricos**, Pearson, 2012

E. González, C. Garrido y J. Cidrás, **Ejercicios resueltos de circuitos eléctricos.**, Editorial Tórculo, 1999

Complementary Bibliography

Recommendations

Other comments

It is very recommended that the students have sufficient knowledge of the algebra of the complex numbers, linear algebra, linear differential equations and have attended to the subject of Physics along the whole first course. Requirements: To enrol in this matter it is necessary to have surpassed or be enrolled of all the matters of the inferior courses to the course in which it is situated this matter.

Contingency plan

Description

=== EXCEPTIONAL MEASURES SCHEDULED ===

In front of it uncertain and unpredictable evolution of the sanitary alert caused by the COVID- 19, the University establishes join extraordinary planning that will actuate in the moment in that the administrations and the own institution determine it attending to criteria of security, health and responsibility, and guaranteeing the teaching in a scenario non-presencial or no totally presencial. These already scheduled measures guarantee, in the moment that was prescriptive, the development of the teaching of a way but easy and effective when being known beforehand (or with a wide advance) by the students and the teaching staff through the tool normalized and institutionalized of the teaching guides DOCNET.

=== ADAPTATION OF THE METHODOLOGIES ===

In the case of teaching non-presencial or no totally presencial, the impartition of the theory will do through videoconference, employing, several ways of communication during them, the platform Remote Campus. The teaching methodologies will fit to the telematic means commented, employing the cameras, the chat and the presentation of documents for the communication with the students. The documentation used, and another complementary, will be put at the disposal of the students through faitic. Doubts will be solved through the email.

* Teaching methodologies that keep

See above.

* Teaching methodologies that modify

See above.

* Mechanism non-presencial of attention to the students (tutorials)

In the case of the tutorials there will be three possibilities. For simple doubts will employ the email. In the case of doubts of higher scales will be able to use to the videoconferences through remote campus and, in the case that these options are not considered valid, will develop of presencial way, always that it was possible to guarantee the sanitary measures.

* Modifications (proceed) of the contained to impart

Do not proceed

* Additional Bibliography to facilitate the learning

Do not proceed

* Other modifications

As regards the practices, will be able to be realized of way non-presencial employing the same means that uses the theoretical teaching, moreover, to use applications of electric circuits, easily downloaded and manageable by the students. Also it will employ, if it will be necessary and in order to supplement to the practices, some video of the laboratory.

=== ADAPTATION OF THE EVALUATION ===

The only change in the case that no could realize the final examination of presencial way, would be that this would realize employing the remote Campus, faitic and/or other platforms put the disposal of the teaching staff.

In the case that the practices non performed in a presencial way, its evaluation would not suffer changes, except the procedure of delivery, that would be through any of the platforms put the disposal of the teaching staff.

* Proofs already realized

Do not proceed

* pending Proofs that keep

Do not proceed.

* Proofs that modify

Do not proceed.

* New proofs

Do not proceed.
* Additional information
Keep the criteria of evaluation suitable to the realization of the proofs, in the case to be necessary and by indication in a Resolución Reitoral, to the telematic means places at the disposal of the teaching staff.

In general, this plan of contingencies will be applied only to be necessary and, in the possible case, it will just take into account the compulsory changes, leaving the rest of circumstances without afectation.