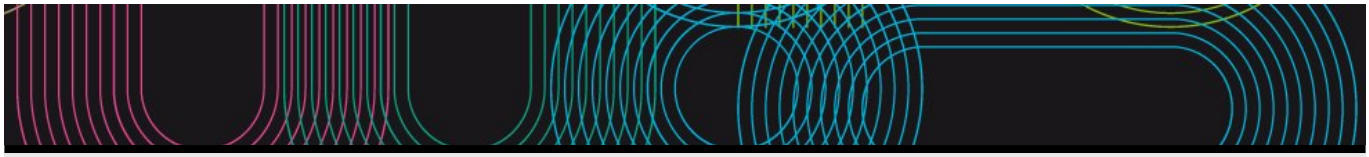
Universidade Vigo

Subject Guide 2016 / 2017



IDENTIFYING DATA				
Basics of Circuit Analysis and Electrical Machines				
Subject	Basics of Circuit Analysis and Electrical Machines			
Code	V12G330V01303			
Study programme	Degree in Industrial Electronics and Automation Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	2nd	1st
Teaching language				
Department				
Coordinator	González Estévez, Emilio José Antonio			
Lecturers	González Estévez, Emilio José Antonio Míguez García, Edelmiro			
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Web	http://faitic.uvigo.es			
General description	(*)Os obxectivos que se perseguen nesta materia son: - Descrición e análise dos elementos dos circuítos eléctricos. - Resolución de circuítos en réxime *estacionario *sinusoidal. - Análise sistemática de circuítos eléctricos. - Conceptos de potencia e enerxía así como a súa determinación. - Análise de circuítos a partir de *teoremas. - Fenómenos nos que se basea a conversión electromagnética de enerxía. - Aspectos xerais comúns e tecnolóxicos das máquinas eléctricas.			

Competencies	
Code	
B3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
C10	CE10 Knowledge and use of the principles of circuit theory and electrical machines.
D1	CT1 Analysis and synthesis.
D2	CT2 Problems resolution.
D6	CT6 Application of computer science in the field of study.
D10	CT10 Self learning and work.
D14	CT14 Creativity.
D16	CT16 Critical thinking.
D17	CT17 Working as a team.
D19	CT19 Personal relationships.

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 D16 D17 D19
Know the experimental process used when it works with electrical circuits.		C10	
Dominate the available current technicians for the analysis of electrical circuits	B3		D1 D2 D6

Deepen in the technicians of numerical resolution of electrical circuits			D1 D2 D6
Know the technicians of measure of the electrical circuits		C10	D2 D17 D19
Purchase skills on the process of analysis of electrical circuits	B3		D1 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 practises	20	10	30
Troubleshooting and / or exercises	10	10	20
Autonomous troubleshooting and / or exercises	0	20	20
Master Session	22	44	66
Long answer tests and development	4	0	4
Reports / memories of practice	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 practises	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.
Troubleshooting and / or exercises	It will solved type problems and exercises in class of big groups and the student will have to solve similar exercises.
Autonomous troubleshooting and / or exercises	The student will have to solve on his own a series of exercises and questions of the matter proposed by the professor.
Master Session	The professor will explain in the classes of big groups the contents of the matter.

Personalized attention

Methodologies	Description
Troubleshooting and / or exercises	The professor will attend personally the doubts and queries of the students during the tutorial hours.
Laboratory practises	The professor will attend personally the doubts and queries of the students during the tutorial hours.

Assessment

	Description	Qualification	Training and Learning Results
Long answer tests and development	It will be performed a "written final examination" that consists of two parts: a test (50% of the mark) and a resolution of problems (50% of the mark). It will be necessary to obtain a minimum mark of 3 points (where the maximum is 10) in each one of the two parts of this exam to pass the subject, that will cover the whole contents of the subject.	80	B3 C10 D1 D2 D10 D14 D16
Reports / memories of practice	It will be valued positively the realisation of a memory of each one of the practices of laboratory that will include: aims, procedure followed, material employed, results obtained and interpretation of them. The realisation of practices and the presentation of the memories, form 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 examination 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 D1 D2 D6 D10 D14 D16 D17 D19

Other comments on the Evaluation

Those students that do not obtain a minimum note of 3 points on 10 in each one of the two parts that it states the " final examination writing", will have, at most in the record of the sunject, a final mark of 4,5.

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 examination written 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 of group:

Groups

A1 (theory and practise): EDELMIRO MIGUEZ GARCÍA

A2 (theory and practise): EMILIO GONZALEZ ESTÉVEZ

Sources of information

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

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

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

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

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

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.