Teaching Guide				
Identifying Data				2017/18
Subject (*)	Electrical engineering		Code	730G05014
Study programme	Grao en Enxeñaría Naval e Oceánica			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Second	Obligatoria	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Industrial			
Coordinador	Menacho Garcia, Carlos Miguel	E-mail	miguel.menacho@udc.es	
Lecturers	Menacho Garcia, Carlos Miguel Vazquez Rodriguez, Santiago	E-mail	miguel.menacho@udc.es santiago.vazquez@udc.es	
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General description	In this course, the analysis of electrical circuits and a brief introduction to the operation of electric machines is studied.			

Study programme competences / results	
Code	Study programme competences / results
A9	Knowledge of the theory of circuits and of the characteristics of you hatch them electrical and ability to carry out calculations of systems that these elements take part in.
B1	That the students proved to have and to understand knowledge in an area of study what part of the base of the secondary education, and itself tends to find to a level that, although it leans in advanced text books, it includes also some aspects that knowledge implicates proceeding from the vanguard of its field of study
B2	That the students know how to apply its knowledge to its work or vocation in a professional way and possess the competences that tend to prove itself by the elaboration and defense of arguments and the resolution of problems in its area of study
B3	That the students have the ability to bring together and to interpret relevant data (normally in its area of study) to emit judgments that include a reflection on relevant subjects of social, scientific or ethical kind
B4	That the students can transmit information, ideas, problems and solutions to a public as much specialized as not specialized
B5	That the students developed those skills of learning necessary to start subsequent studies with a high degree of autonomy
B6	Be able to carrying out a critical analysis, evaluation and synthesis of new and complex ideas.
C1	Using the basic tools of the technologies of the information and the communications (TIC) necessary for the exercise of its profession and for the learning throughout its life.
C2	Coming across for the exercise of a, cultivated open citizenship, awkward, democratic and supportive criticism, capable of analyzing the reality, diagnosing problems, formulating and implanting solutions based on the knowledge and orientated to the common good.
C3	Understanding the importance of the enterprising culture and knowing the means within reach of the enterprising people.
C4	Recognizing critically the knowledge, the technology and the available information to solve the problems that they must face.
C5	Assuming the importance of the learning as professional and as citizen throughout the life.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Apply Ohm's law and Kirchhoff's laws.	A9	B1	C1
Use correct general methods of analysis of DC circuits.		B2	C2
Analyze any direct current circuit using the most appropriate method.		B3	C3
		B4	C4
		B5	C5
		B6	

Interpret and differentiate between different types of AC power. Use correctly general methods of analysis of alternating current circuits. Analyzing any AC circuit using the most appropriate method.	A9	B1 B2 B3 B4 B5 B6	C1 C2 C3 C4 C5
To analyze the operation of the three-phase balanced and unbalanced circuits. Interpret, differentiate and measure various types of power present in three-phase circuits.	A9	B1 B2 B3 B4 B5 B6	C1 C2 C3 C4 C5
Understanding the difference between the transitional regime and the steady or stationary state of a circuit. Learn to get the relevant initial conditions in an electrical circuit. Clearly identify the final steady state (elapsed long enough) expected of a circuit. Distinguish circuits first and second order. Get representative differential equation for each circuit transient.	A9	B1 B2 B3 B4 B5 B6	C1 C2 C3 C4 C5
Know the basic principles of electromagnetic energy conversion system. Know the basics and general operating principles of electric machines.	A9	B1 B2 B3 B4 B5 B6	C1 C2 C3 C4 C5

Contents	
Topic	**Sub-topic**
Analysis of DC circuits	Basics Circuit elements Association of elements Waveforms Mesh analysis Nodal analysis Circuit Theorems
Analysis of AC circuits	Basics Analysis of circuits in sinusoidal steady state Power and energy steady state sinusoidal Theorems steady state sinusoidal
Analysis three-phase circuits	Overview Balanced and unbalanced three-phase circuits Power in three-phase circuits Measurement of power in three-phase circuits
Circuit analysis transient	Basics First order circuits Second order circuits Laplace Transform
Introduction to the operation of electric machines	Magnetic circuits and energy conversion General principles of electrical machines

Planning

Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Introductory activities	A9 C5	1.5	0	1.5
Guest lecture / keynote speech	A9 B1 B2 B3 B4 B5 B6 C1 C2 C3 C4 C5	24	38	62
Problem solving	A9 B1 B2 B3 B4 B5 B6 C1 C2 C3 C4 C5	22	33	55
Laboratory practice	A9 B1 B2 B3 B4 B5 B6 C1 C2 C3 C4 C5	9	5	14
Objective test	A9 B1 B2	2	12	14
Multiple-choice questions	A9 B1 B2	0.5	2	2.5
Personalized attention		1	0	1
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Introductory activities	Presentation of the subject, in large group (GG).
Guest lecture / keynote speech	Oral presentation complemented the use of media and the introduction of questions aimed at motivating students, in order to impart knowledge and facilitate learning. Corresponds to the kind of theory, large group (GG).
Problem solving	Technique by to be solved a particular problem situation, from the knowledge and procedures that have been studied and worked. Corresponds to the class of problems, medium group (GM).
Laboratory practice	Methodology that allows students to apply the knowledge acquired through the completion of practical activities. It is for the workshop exercises, small group (GP).
Objective test	Written test used for the assessment of learning. In order to more rigorously assess the achievement of the objectives, the test consists of two parts: multiple choice questions (items) and problem solving. Multiple choice questions (items) is a measuring instrument, whose distinctive feature is that it allows the answers qualify as correct or not; and to assess the knowledge acquired. Troubleshooting: part that is intended to evaluate conceptual, procedural and attitudinal. It is for the consideration of theory and problems.
Multiple-choice questions	Objective test consisting raise a question as direct question or incomplete statement with several response options or alternatives that provide possible solutions, of which only one is valid. Corresponds to practice exam workshop.

Personalized attention	
Methodologies	Description
Objective test	Tutorials review.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Multiple-choice questions	A9 B1 B2	The grade will be the sum of the amount of the assistance and assessment practices workshop note, which is valued between 0 and 5 points, and the note of a final exam (multiple choice test), which was also assessed from 0 to 5 points.	10
Objective test	A9 B1 B2	This test involves problem solving and / or items, and will be computed between 0 and 10 points.	80
Laboratory practice	A9 B1 B2 B3 B4 B5 B6 C1 C2 C3 C4 C5	The grade will be the sum of the amount of the assistance and assessment practices workshop note, which is valued between 0 and 5 points, and the note of a final exam (multiple choice test), which was also assessed from 0 to 5 points.	10

Assessment comments
To pass the subject it is necessary to approve the part of theory and problems and the part of laboratory practices. The subject will also be approved if it reaches a mark of more than or equal to 3'5 points in the note of laboratory practices, compensate with the part of theory and problems. The final grade is the sum of the (theory and problems note) * 0'80 and the (laboratory practice note) * 0'20. In the presentation of the subject (first day of class) may indicate additional activities whose assessment will add to the note of the objective test of the part of theory and problems. In any case, the note of this part can not be more than 10 points.

Sources of information	
Basic	- Fraile Mora, J. (2012). Circuitos eléctricos. Madrid: Pearson - Alexander, C.K. y Sadiku, M.N.O. (2013). Fundamentos de circuitos eléctricos. Méjico: McGraw-Hill - Parra, V. et al. (1976). Unidades didácticas de teoría de circuitos (2 vols.). Madrid: UNED - Fraile Mora, J. (2008). Máquinas eléctricas. Madrid: McGraw-Hill - Eguiluz Morán, L.I. (1986). Pruebas objetivas de ingeniería eléctrica. Madrid: Alhambra - Eguiluz Morán, L.I. et al. (2001). Pruebas objetivas de circuitos eléctricos. Barañáin (Navarra): EUNSA - Eguiluz Morán, L.I. y Sánchez Barrios, P. (1989). Pruebas de examen de teoría de circuitos. Santander: Universidad de Cantabria - Sánchez Barrios, P. et al. (2007). Teoría de circuitos: problemas y pruebas objetivas orientadas al aprendizaje.. Madrid: Pearson/Prentice Hall - Humet, L., Alabern, X. y García, A. (1997). Tests de Electrotecnia. Fundamentos de circuitos. Barcelona: Marcombo - Paul, C.R. (2001). Fundamentals of electric circuits analysis. USA: John Willey and Sons
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Calculus /730G03001 Linear Algebra/730G03006 Physics II/730G03009
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Fundamentals of Electronic Circuits/730G03016 Installations for Industrial Plants/730G03031
Other comments

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.