



## Teaching Guide

Identifying Data				
Subject (*)			Code	2023/24
Electronics Technology			614G01005	
Study programme				
Grao en Enxeñaría Informática				
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	First	Basic training	6
Language	SpanishGalicianEnglish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría de Computadores			
Coordinator	Bregains Rodriguez, Julio Claudio		E-mail	julio.bregains@udc.es
Lecturers	Blanco Novoa, Óscar Bregains Rodriguez, Julio Claudio Castro Castro, Paula Maria Fraga Lamas, Paula García Naya, José Antonio Gonzalez Lopez, Miguel Iglesia Iglesias, Daniel Ismael Lamas Seco, Jose Juan Rodas González, Javier Vazquez Araujo, Francisco Javier		E-mail	o.blanco@udc.es julio.bregains@udc.es paula.castro@udc.es paula.fraga@udc.es jose.garcia.naya@udc.es miguel.gonzalez.lopez@udc.es daniel.iglesia@udc.es jose.juan.lamas.seco@udc.es javier.rodas@udc.es francisco.vazquez@udc.es
Web	campusvirtual.udc.es			
General description	Physical principles of semiconductors and logic families. Electronic and photonic devices. Electronic circuits.			

## Study programme competences / results

Code	Study programme competences / results
A2	Comprensión e dominio dos conceptos básicos de campos e ondas, e electromagnetismo, teoría de circuitos eléctricos, circuitos electrónicos, principio físico dos semicondutores e familias lóxicas, dispositivos electrónicos e fotónicos e a súa aplicación para a resolución de problemas propios da enxeñaría.
B1	Capacidade de resolución de problemas
B3	Capacidade de análise e síntese
C2	Dominar a expresión e a comprensión de forma oral e escrita dun idioma estranxeiro.
C6	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.

## Learning outcomes

Learning outcomes	Study programme competences / results		
To learn fundamental physical concepts governing computer functioning: electrical and electronic circuits.	A2	B1 B3	C2 C6
Practical applications of the solid-state devices and analog and digital integrated circuits.	A2	B1 B3	C2 C6

## Contents

Topic	Sub-topic
Chapter 1. Electric circuits	1.1 Basic concepts of electricity. Ohm's law. 1.2 Voltage and current sources. Power. 1.3 Electrical circuits. Kirchhoff's laws. 1.4 Circuits theorems.



Chapter 2. Charging and discharging capacitors. Amplifiers	2.1 Waveforms. Fundamental parameters. 2.2 Behavior of the capacitor parameters with respect to time. 2.3 R-C circuits in the time domain. 2.4 R-C Integrator and differentiator circuits. 2.5 Foundations of amplifiers
Chapter 3. Semiconductor diodes	3.1 Physical principles of semiconductor devices. 3.2 p-n junction. 3.3 Diode V-I characteristic. Linear models. 3.4 Avalanche diodes. LED. Photodiodes.
Chapter 4. Transistors	4.1 MOSFET unipolar transistors. 4.2 V-I characteristic in common-source mode. 4.3 Operational regions and linear equivalent models. 4.4 MOSFET transistors in amplifying and switching modes.
Chapter 5. Logic circuits	5.1 Introduction. General properties of digital circuits. 5.2 The CMOS inverter. 5.3 CMOS gates. 5.4 CMOS families.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Guest lecture / keynote speech	A2 B1 B3 C2 C6	30	42	72
Laboratory practice	A2 B1 B3 C2 C6	20	30	50
Problem solving	A2 B1 B3 C2 C6	10	14	24
Mixed objective/subjective test	A2 B1 B3 C2 C6	3	0	3
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
Guest lecture / keynote speech	Educational exposition, using both slides and blackboard, of the theoretical contents of the subject. Examples.
Laboratory practice	Students will perform laboratory practices for circuit analysis.  The students registered part-time and with academic dispensation of exemption attendance will develop the practices not necessarily on-site, and the submission and defense dates will be adjustable.
Problem solving	Students learn how to formulate and solve representative exercises. They also gather together in small groups in order to share their knowledge and discuss some results.
Mixed objective/subjective test	Exam about the contents of the subject combining theoretical questions with practical exercises.

Personalized attention	
Methodologies	Description



Guest lecture / keynote speech	Guest lecture/keynote speech: To solve questions from the students related to the theoretical concepts introduced during the lectures.
Laboratory practice	Laboratory practice; To solve questions from the students related to the proposed exercises to be solved in the electronics laboratory with the help of the basic instrumentation equipment.
Problem solving	Problem solving; To solve questions from the students related to the proposed exemplary exercises.
	In all cases, communication with the students will take place using the individual tutoring hours, through email, Teams, or by making use of the corresponding Moodle tools. These two last cases will be particularly adequate for those students with with academic dispensation of exemption attendance.
	For those students registered part-time the timetable the tutoring hours could be adapted according to needs.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Laboratory practice	A2 B1 B3 C2 C6	Evaluation of the exercises solved by the student in the electronics laboratory.	20
Problem solving	A2 B1 B3 C2 C6	Evaluation, by means of mixed tests, of the exemplary exercises solved by the student.	40
Mixed objective/subjective test	A2 B1 B3 C2 C6	Final evaluation of the theoretical concepts and problem solving skills.	40

Assessment comments
<p>The evaluation of this subject consists of:</p> <ul style="list-style-type: none"><li>- final exam including theoretical questions and practical exercises,</li><li>- practices exam, and.</li><li>- problem-solving tests during the lecture period.</li></ul> <p>The final mark is obtained as follows: Final mark = A + B + C, where:</p> <p>A = mark corresponding to the final exam (0 to 4),</p> <p>B = mark corresponding to the laboratory exercises (0 to 2), and</p> <p>C = mark corresponding to the problem-solving tests (0 to 4).</p> <p>To pass the course, the following must be fulfilled: final grade higher than or equal to 5, having obtained at least 1 point in the final exam. If such a minimum of 1 point is not obtained, the final grade will be equal to (B+C)/2.</p> <p>Academic fraud in the performance of tests or evaluation activities: The fraudulent performance of the evaluation tests or activities, once verified, will directly imply the qualification of failure in the call in which it is committed: the student will be qualified with "suspenso" (numerical grade 0) in the corresponding call of the academic year, whether the commission of the fault occurs in the first opportunity or in the second. For this, the student's grade will be modified in the first opportunity report, if necessary.</p> <p>In the second opportunity (July) only the final exam can be repeated (A). Marks corresponding to the laboratory exercises (B) and SGT problem-solving tests (C) correspond to those obtained during the lecture period. In this opportunity the student will have at his/her disposal an SGT exam, in addition to the corresponding final exam. In case of taking the additional SGT exam, the grade obtained in the exam will cancel the SGT grade obtained in the first opportunity.</p> <p>For the Early Assessment Opportunity the same criteria as for the second opportunity will apply.</p> <p>The evaluation criteria, scoring (see paragraph above), and activities for the students registered part time and with academic dispensation of exemption attendance will be the same as those required for the rest of the students. In this case, the complexity and contents of the evaluations will also be similar to those specified for the rest of the students.</p>



<b>Basic</b>	<p>- (). .</p> <p>Material of the subject (slides, lecture notes, proposed and solved exercises, etc.).Schaum's Outline of Electric Circuits, Sixth Edition, 2014 McGraw-Hill Education, ISBN: 9780071830454Electronics. Allan R. Hambley. Ed. Prentice HallMaterial of the subject (slides, lecture notes, proposed and solved exercises, etc.).Schaum's Outline of Electric Circuits, Sixth Edition, 2014 McGraw-Hill Education, ISBN: 9780071830454Electronics. Allan R. Hambley. Ed. Prentice Hall</p>
<b>Complementary</b>	<p>References in English:Robert L. Boylestad, "Introductory Circuit Analysis", Prentice Hall.Robert L. Boylestad, "Electronic Devices and Circuit Theory", Pearson.Donald E. Scott, "Introduction to Circuit Analysis: A Systems Approach", McGraw-Hill Series in Electrical Engineering.Jacob Millman, "Microelectronics: Digital and Analog Circuits and Systems", McGraw-Hill.Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits: International Edition", Oxford.Albert PAul Malvino, "Electronic Principles", McGraw-Hill.Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", Prentice Hall.Norbert R. Malik and Norb Malik, "Electronic Circuits: Analysis, Simulation, and Design (And Clinical Aspects)", Prentice Hall.Muhammad H. Rashid, "Microelectronic Circuits: Analysis and Design", Cengage Learning.References in Spanish:Electricidad Básica. Problemas Resueltos. Julio C. Brégains y Paula M. Castro. Ed. Starbook, ISBN 978-84-15457-25-1, 2012.Electrónica Básica. Problemas Resueltos. Julio C. Brégains y Paula M. Castro. Ed. Starbook, 2012.</p>

## Recommendations

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

Computer Science Preliminaries/614G01002  
Calculus/614G01003

### Subjects that are recommended to be taken simultaneously

Fundamentals of Computers/614G01007

### Subjects that continue the syllabus

Fundamentals of Computers/614G01007  
Computer Structure/614G01012  
Networks/614G01017  
Concurrency and Parallelism/614G01018  
Infrastructure Management/614G01025  
Hardware Devices and Interfaces/614G01032

### Other comments

Students in this subject should have a basic knowledge about differential and integral calculus as well as electromagnetism.A sustainable use of the resources and the prevention of negative impacts on the natural environment must be made.It must be taken into account the importance of ethical principles related to the awareness of sustainability values in personal and professional behaviors.

(\*)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.