



Teaching Guide				
Identifying Data				2023/24
Subject (*)	Electronics and Control Systems	Code	631G03016	
Study programme	Grao en Máquinas Navais			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Second	Obligatory	6
Language	SpanishGalician			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría de ComputadoresEnxeñaría Industrial			
Coordinador	Rodríguez Gómez, Benigno Antonio	E-mail	benigno.rodriguez@udc.es	
Lecturers	Andión Fernández, José Manuel Lobeiras Blanco, Jacobo Rodríguez Gómez, Benigno Antonio	E-mail	jose.manuel.andion@udc.es jacobolobeiras@udc.es benigno.rodriguez@udc.es	
Web				
General description	The aim of this subject is to provide students with basic concepts in the field of Electronics and Control Systems, in order to serve as a basic support for other subjects they will take later on. It is also intended that students become familiar with the use of the laboratory instruments of these subjects.			

Study programme competences	
Code	Study programme competences
A2	CE02 - Facer funcionar a maquinaria principal e auxiliar e os sistemas de control correspondentes.
A4	CE04 - Facer funcionar os sistemas eléctricos, electrónicos e de control.
A11	CE11 - Manter e reparar o equipo eléctrico e electrónico.
A18	CE18 - Supervisar o funcionamento dos sistemas eléctricos, electrónicos e de control.
A25	CE25 - Manter e reparar os sistemas eléctricos, electrónicos e de control da maquinaria de cuberta e do equipo de manipulación da carga.
A73	CE73 - Modelizar situacións e resolver problemas con técnicas ou ferramentas físico-matemáticas.
A74	CE74 - Avaliar de forma cualitativa e cuantitativa os datos e resultados, así como a representación e interpretación matemáticas de resultados obtidos experimentalmente.
A90	CE90 - Operar, reparar, manter e optimizar a nivel operacional as instalacións industriais relacionadas coa enxeñaría mariña, como motores alternativos de combustión interna e subsistemas; turbinas de vapor e de gas, caldeiras e subsistemas asociados; ciclos combinados; equipos eléctricos, electrónicos, e de regulación e control; as instalacións auxiliares, tales como instalacións frigoríficas, instalacións de aire acondicionado, plantas potabilizadoras, grupos electrógenos, etc.
A91	CE91 - Redactar e interpretar documentación técnica.
A99	CE99 - Ter a capacidade para exercer como Oficial de Máquinas da Mariña Mercante, unha vez superados os requisitos esixidos pola Administración Marítima.
A100	CE100 - Ter a capacidade para exercer como oficial ETO da Mariña Mercante, unha vez superados os requisitos esixidos pola Administración Marítima.
B1	CB1 - Demostrar que posúen e comprenden coñecementos na área de estudo que parte da base da educación secundaria xeneral, e que inclúe coñecementos procedentes da vangarda do seu campo de estudo
B5	CB5 - Ter desenvolvido aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores con un alto grao de autonomía.
B7	CG02 - Resolver problemas de forma efectiva.
B9	CG04 - Traballar de forma autónoma con iniciativa.
B10	CG05 - Traballar de forma colaborativa.
B13	CG08 - Capacidade para a aprendizaxe de novos métodos e teorías, que lle doten dunha gran versatilidade para adaptarse a novas situacións.



B16	CG11 - Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben afrontarse.
C3	CT03 - Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C8	CT08 - Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.

Learning outcomes			
Learning outcomes	Study programme competences		
Know basic electronic devices (diodes, transistors, power devices and operational amplifiers) and their application in electronic circuits.	A4 A11 A18 A25 A73 A74 A90 A91 A99 A100	B1 B5 B7 B9 B13 B16	C3 C8
Acquiring basic notions of digital electronics.	A4 A11 A18 A25 A73 A74 A90 A91 A99 A100	B1 B5 B7 B9 B13 B16	C3 C8
Knowing the basic operation of analogue and digital electronic instrumentation.	A2 A4 A11 A18 A25 A74 A90 A91 A99 A100	B5 B7 B9 B10	
Understand the principles of operation of regulation and control systems.	A2 A4 A18 A73 A91 A99 A100	B1 B5 B7 B9 B13 B16	C3 C8



Identify the elements that form part of the system and the role played by each one.	A2 A4 A25 A90 A91 A99 A100	B7 B9 B16	C3 C8
Recognise the possible anomalous behaviour of a system.	A2 A4 A18 A25 A73 A74 A90 A91 A99 A100	B1 B7 B9 B10 B13 B16	C3 C8
Apply heuristic techniques for tuning controller.	A2 A4 A18 A25 A73 A74 A90 A91 A99 A100	B1 B5 B7 B9 B10 B13 B16	C3 C8

Contents	
Topic	Sub-topic
Analogue electronics	Diodes. Circuits with diodes. Transistors. Circuits with transistors. Operational amplifiers. Circuits with operational amplifiers.
Power electronics	Power electronic devices. Circuits with power electronic devices.
Digital electronics	Logic gates. Logic circuits.
Systems Representation.	Dynamical System Concept Modelling and estimation of linear systems. Graphical representations.
Time response analysis.	Test signals. Typical responses for first and second order systems. Steady-state and transient modes Characteristic parameters
Controllers, types, operation and tuning.	ON/OFF Controllers PID Controllers PID Controller Tuning Other types of controllers

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours



Problem solving	A4 A11 A18 A25 A73 A74 A90 A91 A99 A100 B1 B5 B7 B9 B10 B13 B16 C3 C8	16	32	48
Laboratory practice	A11 A25 A74 A90 A91 B9 B10	8	16	24
Mixed objective/subjective test	A2 A4 A11 A18 A25 A73 A74 A90 A91 A99 A100 B1 B5 B7 B9 B13 B16 C3 C8	8	8	16
Guest lecture / keynote speech	A2 A4 A11 A18 A25 A73 A74 A90 A91 A99 A100 B1 B5 B13 B16 C8	30	30	60
Personalized attention		2	0	2

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

Methodologies	
Methodologies	Description
Problem solving	Applied learning method in which the student is required to use knowledge gained from study to propose some solution to a specific problem.
Laboratory practice	Practice-based learning method involving activities such as demonstrations, exercises, experiments and research. The practices may be carried out with physical or virtual elements by means of computer applications, in this case.
Mixed objective/subjective test	A test in which written answers to questions of a certain scope are sought, assessing whether the expected answer is provided, combined with the ability to reason (argue, relate, etc.), creativity and critical spirit. Questions of a different nature can be combined, developing themes, answering questions in a reasoned manner, solving problems, etc.
Guest lecture / keynote speech	Oral presentation (using audiovisual material and student interaction) designed to transmit knowledge and encourage learning.

Personalized attention	
Methodologies	Description
Laboratory practice Guest lecture / keynote speech Problem solving	Personalised attention is given in the classroom and in the laboratory, attending to students' particular doubts when some of them requires the teacher's attention.  In addition, outside these spaces, students can go to the individual coaching during the established timetable to resolve any question related to the subject. Or, if they wish, they can be attended by TEAMS, e-mail or messaging from the Virtual Campus.

Assessment			
Methodologies	Competencies	Description	Qualification
Mixed objective/subjective test	A2 A4 A11 A18 A25 A73 A74 A90 A91 A99 A100 B1 B5 B7 B9 B13 B16 C3 C8	It shall consist of one or several tests, which shall be of a global nature in order to assess the different parts of the subject.  The contents of the test may be varied: problem solving, questions of reasoning on the subject matter, development of a topic, or any other form of demonstration of knowledge.	70



Laboratory practice	A11 A25 A74 A90 A91 B9 B10	<p>Practical exercises will be carried out in the laboratories suitable for their performance. The students will make appropriate use of the relevant materials and equipment, and will proceed to carry out the assemblies and checks indicated to them.</p> <p>In addition to physical elements, these practicals may also be carried out by means of software simulation.</p>	10
Problem solving	A4 A11 A18 A25 A73 A74 A90 A91 A99 A100 B1 B5 B7 B9 B10 B13 B16 C3 C8	<p>Problem solving will be carried out as an application of the theory taught in the lectures.</p> <p>Attendance, participation and demonstration of understanding of the theory through its application to the statements proposed by the lecturer will be assessed.</p> <p>Exercises may be presented both in traditional formats and using ICT tools.</p>	20

### Assessment comments

The subject is structured in two independent parts, which will be evaluated separately, on the one hand Electronics and on the other Control Systems. In order to pass the subject it is necessary to pass each of these parts, as the grade of one of them will not be valid to compensate the other. The criteria for passing the subject in both the first and the second opportunity will be the same.

For students with recognition of part-time dedication and academic dispensation of exemption from attendance, as established in the "NORMATIVA REGULADORA DEL RÉGIMEN DE DEDICACIÓN AL ESTUDIO DE LOS ESTUDIANTES DE GRADO Y MÁSTER UNIVERSITARIO DE LA UDC (Arts. 2.3; 3.b; 4.3 and 7.5) (04/05/2017), most of the activities may be carried out asynchronously and/or remotely. For the laboratory practicals, if they cannot attend them, an alternative activity of similar content will be proposed.

The fraudulent performance of tests or evaluation activities, once verified, will directly imply the qualification of failure in the call in which it is committed: the student will be graded with "suspense" (numerical grade 0) in the corresponding call of the academic year, whether the commission of the fault occurs in the first opportunity as in the second. For this, the student's grade will be modified in the first opportunity report, if necessary.

The assessment criteria set out in table A-III/6 of the STCW Code, and included in the Quality Assurance System, will be taken into account when designing and carrying out the assessment.

### Sources of information

<b>Basic</b>	<ul style="list-style-type: none"> <li>- Malvino, Albert P. e Bates, David J. (2007). Principios de electrónica. Madrid : McGraw-Hill</li> <li>- Brégains, Julio C. e Castro, Paula M. (2013). Electrónica básica : problemas resueltos. Madrid : StarBook</li> <li>- Boylestad, Robert L. e Nashelsky, Louis (2018). Electrónica : teoría de circuitos y dispositivos electrónicos. México : Pearson</li> <li>- Ogata, Katsuhiko. (). Ingeniería de Control Moderna. Madrid : Pearson Educación</li> <li>- Roca, Alfredo (2014). Control automático de procesos industriales : con prácticas de simulación y análisis por ordenador PC. Madrid : Díaz de Santos,</li> <li>- St. Clair, David W. (1991). Sintonizado de controladores y comportamiento del lazo de control Un libro de fundamentos. Barcelona : Tiempo Real</li> </ul> <p>Indícase a edición de 2007 do texto de Malvino por haber varias copias en toda a UDC e estar dispoñible electrónicamente, pero as edicións anteriores conteñen a práctica totalidade do contido introdutorio que se trata nesta materia. Isto mesmo é aplicable ó texto de Boylestad.O texto de Ogata ten múltiples edicións en diferentes anos, non se indica ningunha en especial porque todos poden valer para a preparación da materia. 681/OGA/ing-X indica que a X pode substituírse por a, b, c,... xa que a signatura vai variando co exemplar. Tamén está dispoñible noutras bibliotecas da UDC.Do texto de Roca, ademáis do exemplar 681/ROC/con, existen outros dispoñibles na biblioteca da UDC, e tamén pode ser consultado como recurso electrónico</p>
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<b>Complementary</b>	<ul style="list-style-type: none"><li>- Siglent Technologies (2014). SPD3000C Series Programmable DC Power Supply. Quick Start. Siglent Technologies</li><li>- Keysight Technologies (2012). Osciloscopios de la serie 1000B de Keysight. Guía del usuario. Keysight Technologies</li><li>- Siglent Technologies (2017). SDG800 Series Function/Arbitrary Waveform Generator. User Manual. Siglent Technologies</li><li>- Analog Devices (). Learn How to Use LTspice: Instructional Videos. Analog Devices</li></ul> <p>Os manuais de uso da instrumentación do laboratorio e o simulador serán proporcionados ó alumnado electrónicamente a través do Campus Virtual, xunto con outro material adicional.</p>
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## Recommendations

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

Electrotechnology and Ship Electrical Machines/631G03015  
Mathematics I/631G03001  
Mathematics II/631G03006  
Physics I/631G03003  
Physics II/631G03008

### Subjects that are recommended to be taken simultaneously

### Subjects that continue the syllabus

Automation of Ship Installations/631G03042  
Automatisms and Control Systems/631G03038  
Analogue Electronics/631G03031  
Digital Electronics/631G03032  
Power Electronics/631G03035

### Other comments

1.- The delivery of the documentary works to be carried out in this matter:1.1.- It will be requested in virtual format and/or computer support.1.2.- It will be done through the E-Learning Platform, in digital format without the need to print them.1.3.- If on paper:- No plastics shall be used.- Double-sided printing shall be used.- Recycled paper shall be used.- The printing of drafts shall be avoided.2.- Sustainable use of resources and prevention of negative impacts on the natural environment shall be made.3.- The importance of ethical principles related to the values of sustainability in personal and professional behavior must be taken into account.4.- According to the different regulations applicable to university teaching, the gender perspective must be incorporated in this subject (non-sexist language will be used, bibliography of authors of both sexes will be used, the intervention of male and female students in class will be encouraged...).5.- We will work to identify and modify sexist prejudices and attitudes, and will influence the environment to modify them and promote values of respect and equality.6.- Situations of gender discrimination should be detected and actions and measures will be proposed to correct them.7.- The full integration of students who, for physical, sensory, mental or sociocultural reasons, experience difficulties in gaining suitable, equal and beneficial access to the following will be facilitated

(\*)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.