UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				**2022/23**
Subject (*)	Electronic Systems for Vessels		**Code**	631G02356
Study programme	Grao en Tecnoloxías Mariñas			
Descriptors				
Cycle	**Period**	**Year**	**Type**	**Credits**
Graduate	2nd four-month period	Third	Optional	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría de Computadores			
Coordinador	Andión Fernández, José Manuel		**E-mail**	jose.manuel.andion@udc.es
Lecturers	Andión Fernández, José Manuel		**E-mail**	jose.manuel.andion@udc.es
Web	campusvirtual.udc.gal			
General description	Esta materia introduce as compoñentes electrónicas que están presentes nos distintos sistemas dun buque. Estúdanse dispositivos semicondutores de electrónica analóxica, de potencia e dixital. Así, o alumnado será capaz de avaliar o seu correcto funcionamento e, polo tanto, de detectar posibles avarías.			

Study programme competences	
Code	**Study programme competences**
A7	CE7 - Capacidade para a operación e posta en marcha de novas instalacións ou que teñan por obxecto a construción, reforma, reparación, conservación, instalación, montaxe ou explotación, realización de medicións, cálculos, valoracións, taxacións, peritacións, estudos, informes, e outros traballos análogos de instalacións enerxéticas e industriais mariñas, nos seus respectivos casos, tanto con carácter principal como accesorio, sempre que quede comprendido pola súa natureza e característica na técnica propia da titulación, dentro do ámbito da súa especialidade, é dicir, operación e explotación.
A14	CE14 - Avaliación cualitativa e cuantitativa de datos e resultados, así como a representación e interpretación matemáticas de resultados obtidos experimentalmente.
A17	CE17 - Modelizar situacións e resolver problemas con técnicas ou ferramentas físico-matemáticas.
A18	CE18 - Redacción e interpretación de documentación técnica.
A30	CE42 - Operar, reparar, manter, reformar, optimizar a nivel operacional as instalacións industriais relacionadas coa enxeñaría mariña, como motores alternativos de combustión interna e subsistemas; turbinas de vapor, caldeiras e subsistemas asociados; ciclos combinados; propulsión eléctrica e propulsión con turbinas de gas; equipos eléctricos, electrónicos, e de regulación e control do buque; as instalacións auxiliares do buque, tales como instalacións frigoríficas, sistemas de goberno, instalacións de aire acondicionado, plantas potabilizadoras, separadores de sentinas, grupos electróxenos, etc.
A31	CE43 - Operar, reparar, manter e optimizar as instalacións auxiliares dos buques que transportan cargas especiais, tales como quimiqueiros, LPG, LNG, petroleiros, cementeiros, Ro-Ro, Pasaxe, botes rápidos, etc.
A47	CE32 - Utilizar as ferramentas manuais e o equipo de medida e proba eléctrico e electrónico para a detección de avarías e as operacións de mantemento e reparación.
B2	CT2 - Resolver problemas de forma efectiva.
B4	CT4 - Traballar de forma autónoma con iniciativa.
B5	CT5 - Traballar de forma colaboradora.
B8	CT8 - Versatilidade.
B9	CT9 - Capacidade para a aprendizaxe de novos métodos e teorías, que lle doten dunha gran versatilidade para adaptarse a novas situacións.
C3	C3 - 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.
C6	C6 - Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C9	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 vanguardia do seu campo de estudo

C13	CB5 - Ter desenvolvido aquelas habilidades de aprendizaxe necesarias para emprender estudos posteriores con un alto grao de autonomía.

Learning outcomes			
Learning outcomes	Study programme competences		
Coñecer os dispositivos electrónicos básicos (díodos, transistores, dispositivos de potencia e amplificadores operacionais) e a súa aplicación en circuítos.	A7 A14 A17 A18 A30 A31	B2 B8 B9	C3 C6 C9 C13
Ser capaz de analizar sistemas combinacionais e secuenciais básicos.	A7 A14 A17 A18 A30 A31	B2 B8 B9	C3 C6 C9 C13
Coñecer os distintos tipos de memorias.	A7 A18 A30 A31	B8 B9	C3 C6 C9 C13
Coñecer o funcionamento básico da instrumentación electrónica analóxica e dixital.	A7 A14 A18 A30 A31 A47	B2 B4 B5 B8 B9	C3 C6 C9 C13

Contents	
Topic	Sub-topic
THEME 1. SEMICONDUCTORS.	1.1. The Intrinsic Semiconductor. 1.2. Extrinsic Semiconductors. 1.3. Currents in a semiconductor
THEME 2. THE DIODE. CIRCUITS WITH DIODES.	2.1.The PN junction. 2.2. V-I characteristic of a diode. 2.3. Zener diodes. 2.4. LED diodes. 2.5. Linear model of the diode. 2.6. Analysis of circuits.
THEME 3. CIRCUITS WITH DIODES: RECTIFIERS.	3.1. Half-wave rectifier. 3.2. Full-wave rectifier. 3.3. Bridge rectifier.
THEME 4. THE BIPOLAR TRANSISTOR. CIRCUITS WITH BJT TRANSISTORS.	4.1. The Bipolar Transistor. 4.2. Current components. The V-I common-emitter (CE) characteristics. 4.3. Regions of operation and limit values. 4.4. Analysis of circuits.
THEME 5. UNIPOLAR TRANSISTOR. UNIPOLAR TRANSISTOR CIRCUITS.	5.1. Field-effect transistors: JFET, MOSFET. 5.2. The field-effect transistors V-I characteristics. 5.3. Analysis of circuits with field-effect transistors.

THEME 6. POWER DEVICES.	6.1. Power devices.
	6.2. Thyristors.
	6.3. Triacs.
	6.4. Power regulation.
	6.5. Analysis of circuits.
THEME 7. THE OPERATIONAL AMPLIFIER. LINEAR AND NONLINEAR APPLICATIONS.	7.1. Basics of amplificacion.
	7.2. The Operational Amplifier.
	7.3. Linear applications.
	7.4. Nonlinear applications.
	7.5. Analysis of circuits.
THEME 8. LOGIC GATES. LOGIC FAMILIES.	8.1. Digital circuits.
	8.2. Logic gates.
	8.3. Logic families: DTL, TTL and CMOS.
	8.4. Analysis of circuits.
THEME 9. SEQUENTIAL LOGIC. COMBINATORIAL LOGIC.	9.1. Sequential systems.
	9.2. The S-R, J-K-, T-, and D-Type Flip-Flops.
	9.3. Registers.
	9.4. Counters.
	9.5. Combinatorial circuits.
LABORATORY PRACTICE SESSIONS	PRACTICE 1: Use of measuring instruments for direct current.
	PRACTICE 2: Use of measuring instruments for alternating current.
	PRACTICE 3: V-I characteristic of a diode. LEDs.
	PRACTICE 4: Rectifier circuits.
	PRACTICE 5: Bipolar transistors.
ICT PRACTICE SESSIONS	PRACTICE 6: Unipolar transistors.
	PRACTICE 7: Thyristors.
	PRACTICE 8: Operational amplifiers.
	PRACTICE 9: The CMOS inverter.
By the development and passing of these contents together with those corresponding to other subjects that includes the acquisition of competences specific to the degree, the knowledge, comprehension and adequacy of the competences contained in Table A11/2, of the STCW Convention is guaranteed, in relation to the level of management of a Chief Mate of the merchant navy on ships without gross tonnage limitation, and a Master of the merchant navy for those of up to a maximum of 500 GT.	Table A-II / 2 of the STCW Convention. Specification of the mandatory minimum requirements of competence for the certification of masters and chief mates on ships of 500 gross tonnage or more.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A7 A18 B9 C6 C9 C13	30	45	75
Problem solving	A14 A17 A18 B2 B4 B8 C6 C9	8	24	32
Laboratory practice	A7 A14 A18 A30 A31 A47 B2 B5 B8 B9 C3 C6 C9 C13	8	10	18

ICT practicals	A7 A14 A17 A18 A30 A31 A47 B2 B5 B8 B9 C3 C6 C9 C13	8	10	18
Mixed objective/subjective test	A7 A14 A17 A18 A30 A31 B2 B4 B8 C6 C9	4	0	4
Personalized attention		3	0	3

(*)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	Didactic exposition, using slides and blackboard of the theoretical content of the subject.
Problem solving	Approach and resolution of problems related to the contents of the subject.
Laboratory practice	Students will work on a series of practices in the Electronics Laboratory working with an electronic practice board.
ICT practicals	Students will work on a series of practices on a PC using the electronic circuits simulator LTspice.
Mixed objective/subjective test	Mixed exam written by the theory Professor about the contents of the course.

Personalized attention	
Methodologies	**Description**
ICT practicals Laboratory practice Guest lecture / keynote speech Problem solving	Keynote session: assist and answer questions from the students in relation to the theoretical material exposed in the keynote sessions.

Problems solving: addressing and solving concerns of students in relation to the problems solved or posed by the teacher in the problem solving sessions.

Laboratory practice: assist and answer questions from students in relation to practices posed or carried out in the laboratory.

Practices through ICT: addressing and solving concerns of students in relation to ICT practices posed or carried out.

Personal attention: in relation to classes of theory and problem solving sessions, preferably using tutoring hours individually. In relation to practical classes, hours of tutoring will be used preferably individually, although e-mail will be possible. |

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
ICT practicals	A7 A14 A17 A18 A30 A31 A47 B2 B5 B8 B9 C3 C6 C9 C13	Realization of practical activities with the PSPICE simulator. The proper functioning of the final circuit will be evaluated as well as the reasoning behind it, explained against possible questions from the teacher during the sessions.	10
Laboratory practice	A7 A14 A18 A30 A31 A47 B2 B5 B8 B9 C3 C6 C9 C13	Realization of practical activities with an electronic demo board. The proper functioning of the final circuit will be evaluated as well as the reasoning behind it, explained against possible questions from the teacher during the sessions.	10
Problem solving	A14 A17 A18 B2 B4 B8 C6 C9	The participation of the student in the exercises posed by the teacher during the course in the problem-solving sessions estimated positively.	30

Mixed objective/subjective test	A7 A14 A17 A18 A30 A31 B2 B4 B8 C6 C9	Written exam about the content taught in masterclasses and problem solving sessions: have a minimum of 3.8 points out of 8. The student must demonstrate a basic knowledge of all the content of the subject in this exam. For students (matriculated full-time or part-time) who regularly attend class (minimum 80% attendance), partial exams could be made throughout the course that could exempt part or all of the subject in the final mixed test. Works carried out independently by the student and posed by the Professor of theory can be presented optionally. The participation of the student in the exercises or works posed by the teacher during the course in the keynote and problem-solving sessions and in the tutorials estimated positively. To pass the course 4 out of 8 must be reached in the final marks of theory and problems.	50
Others			

Assessment comments

The evaluation of the content taught in masterclasses and problem solving sessions of the subject represents 80% of the total marks. The evaluation of laboratory and ICT practices by the short answer questions is the remaining 20%.

To pass the course will be required:

1) Mixed exam: written exam about the content taught in masterclasses and problem solving sessions: have a minimum of 3.8 points out of 8. The student must demonstrate a basic knowledge of all the content of the subject in this exam. To pass the exam none of the answers to the questions can be blank.

For students (matriculated full time or part time) who regularly attend class (minimum 80% attendance), partial exams could be made throughout the course that could exempt part or all of the subject in the final mixed test.

Works carried out independently by the student and posed by the Professor of theory can be presented optionally.

Answers to the teacher during the course in the keynote and problem-solving sessions and in the tutorials could be estimated positively.

To pass the course, 4 out of 8 must be reached in the final marks of theory and problems.

2) Have a minimum of 1 point out of 2 in the short answer questionnaire.

For students (matriculated full time or part time) who regularly attend class (minimum 80% attendance), a continuous assessment could be made throughout the course that could exempt part or all of the subject in the final short answer questionnaire.

The participation of the student in the practical sessions and his explanations to questions posed by the teacher during the sessions will be considered.

If a minimum of 4 out of 8 is not obtained in the final marks of theory and problems, the practice marks will be divided by two to calculate the final marks. If in practice the minimum 1 was not obtained, to calculate the final grade the geometric mean weighted will be made.

In order to be able to pass the subject, full-time and part-time students must attend more than the 80 % of the ordinary class hours of "Laboratory practice" and "ICT practicals" (unless she/he has attended in previous years). The students which have the academic exemption of attendance, according to the "NORMA QUE REGULA O RÉXIME DE DEDICACIÓN AO ESTUDO DOS ESTUDANTES DE GRAO NA UDC (Arts. 2.3; 3.b; 4.3 e 7.5) (04/05/2017), will replace this requirement with an aptitude test about the use of the laboratory instrumentation.

The evaluation criteria

considered in tables A-III/1 and A-III/3 of the STCW Code and its amendments

related to this subject shall be taken into account when designing and

evaluating.

Sources of information

Basic	- Malvino, Albert Paul e Bates, David J. (2007). Principios de electrónica. Madrid : McGraw-Hill
	- Brégains, Julio C. e Castro, Paula M. (2013). Electrónica básica : problemas resueltos. Paracuellos del Jarama : Starbook
	- Boylestad, Robert L. e Nashelsky, Louis (2018). Electrónica : teoría de circuitos y dispositivos electrónicos. México : Pearson
Complementary	- Millman, Jacob e Grabel, Arvin (1991). Microelectrónica. Barcelona : Edit. Hispano Europea
	- Millman, Jacob e Halkias, Christos C. (1991). Electrónica integrada circuitos y sistemas analógicos y digitales. Barcelona : Edit. Hispano Europea
	- Keysight Technologies (2012). Osciloscopios de la serie 1000B de Keysight. Guía del usuario. Keysight Technologies
	- Siglent Technologies (2017). SDG800 Series Function/Arbitrary Waveform Generator. User Manual. Siglent Technologies
	- Linear Technology (2009). LTspice User Manual. Linear Technology
	- Varios Autores (2020). LTspice Users Group. https://groups.io/g/LTspice

Recommendations
Subjects that it is recommended to have taken before
Mathematics I/631G02151
Informatics/631G02154
Mathematics II/631G02156
Chemistry/631G02157
Physics II/631G02158
Mathematics III/631G02260
Regulation and Control Fundamentals/631G02257
Electrotechnology, Electrical Machinery and Electronic Systems for Vessels/631G02253
Subjects that are recommended to be taken simultaneously
Maritime Installations and Propulsion Systems/631G02357
Subjects that continue the syllabus
Electronic Systems for Data Acquisition/631G02512
Electronic Communication Systems and Navigation Aids/631G02457
Digital Electronics/631G02364
Power and Analogue Electronics/631G02363
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.