Teaching Guide				
Identifying Data				2018/19
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	Obligatory	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría de Computadores			
Coordinador	Novo Vidal, Maria Elena	E-mail	e.novo@udc.es	
Lecturers	Andión Fernández, José Manuel Novo Vidal, Maria Elena	E-mail	jose.manuel.andion@udc.es e.novo@udc.es	
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General description				

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.
A63	CE53 - Supervisar o funcionamento dos sistemas eléctricos, electrónicos e de control
A68	CE58 - Manter e reparar o equipo eléctrico e electrónico
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		
Acquire the basic physical concepts related to ship engine room control systems: electrical and electronic circuits.	A7 A14 A17 A18 A30 A47	B2 B4 B5 B9	C3 C6 C9 C13
Knowledge of the characteristics of basic semiconductor devices.	A14 A17 A18 A47	B2 B4 B5 B9	C3 C6 C9 C13
Practical applications of analog and digital integrated circuits, and solid state devices.	A14 A17 A18 A30 A31 A47 A63 A68	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.
PROBLEM SOLVING AND GROUP TUTORING SESSIONS.	SESSION 1: Analysis of circuits with Diodes: linear model of the Diode. SESSION 2: Analysis of circuits with Diodes: Rectifiers. SESSION 3: Analysis of circuits with Bipolar Transistors. SESSION 4: Analysis of circuits with Bipolar Transistors. SESSION 5: Analysis of circuits with Unipolar Transistors. SESSION 6: Analysis of circuits with power devices. SESSION 7: Analysis of circuits with power devices. SESSION 8: Analysis of circuits with Operational Amplifiers. SESSION 9: Analysis of circuits with Operational Amplifiers.
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 AIII / 2 of the STCW Convention is guaranteed in relation to the level of management of a First Engineer Officer of the Merchant Navy on ships without power limitation of the main propulsion machinery, and Chief Engineer officer of the Merchant Navy up to a maximum of 3000 kW.	Table A-III / 2 of the STCW Convention. Specification of the minimum standard of competence for Chief Engineer Officers and First Engineer Officers on ships powered by main propulsion machinery of 3000 kW or more.

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

Guest lecture / keynote speech	A14 A17 A18 B2 B9 C6 C13	27	54	81
Problem solving	A14 A17 A18 B2 B4 B8 C6 C9	9	18	27
Mixed objective/subjective test	A7 A14 A17 A18 A30 A31 B2 C6 C9	3	0	3
Laboratory practice	A14 A18 A47 A63 A68 B5 B9 C6	10	10	20
ICT practicals	A14 A17 A18 B2 B4 B8 B9 C3 C6	8	8	16
Short answer questions	A14 A17 A47 B2 C3 C6	2	0	2
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	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.
Mixed objective/subjective test	Mixed exam written by the theory Professor about the contents of the course.
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.
Short answer questions	Short answer objective test to evaluate the knowledge and skills acquired by students in the management of electronic instrumentation during laboratory practices.

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**

Mixed objective/subjective test	A7 A14 A17 A18 A30 A31 B2 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), a continuous assessment 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 estimated positively. To pass the course 4 out of 8 must be reached in the final marks of theory and problems.	80
Short answer questions	A14 A17 A47 B2 C3 C6	It will consist of a short answer questionnaire about the contents of the practical sessions. It will evaluate not only the understanding of these, but also the student's ability to establish critical judgements and the ability to manage the laboratory instrumentation. 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.	20
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.
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 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 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 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.
All students, including the ones who have been recognised as part-time students with 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), must attend more than the 80 % of the ordinary class hours of "Laboratory practice" and "ICT practicals" to be able to pass the subject (unless she/he has attended in previous years).
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	- Jacob Millman y Christos C.Halkias (1984). Electrónica Integrada:Circuitos y Sistemas Analógicos y Digitales. Ed. Hispano Europea. 4ª Edición. - Robert L. Boylestad y Louis Nashelsky (2009). Electrónica: Teoría de circuitos y dispositivos electrónicos. . Ed. Prentice Hall. 10ª Edición - Mª Elena Novo Vidal (2018). Copia de las diapositivas de la asignatura con problemas resueltos. Reprografía - Albert Malvino y David J. Bates (2010). Principios de Electrónica.. Ed. McGraw Hill. 7ª Edición. - José Manuel Andión Fernández (2018). Prácticas de laboratorio y simulador. Moodle: https://moodle.udc.es/ - José Luis Calvo Rolle (2003). Edición y simulación de circuitos con Orcad. Ed. Ra-Ma - Roy W. Goody (2002). Orcad PSpice para Windows, Vol. II: Dispositivos, circuitos y amplificadores operacionales. Ed. Prentice Hall
Complementary	- Jacob Millman (1986). Microelectrónica. Circuitos y sistemas analógicos y digitales. Ed. Hispano Europea. 3ª Edición. - F. Aldana Mayor y otros (1976). Electróncia I. Publicaciones E.T.S.I. Industriales Madrid - Jacob Millman y Christos C.Halkias (1982). Dispositivos y circuitos electrónicos. Ed. Pirámide. 10ª Edición. - Jacob Millman y Arvin Grabel (1995). Microelectrónica . Ed. Hispano Europea. 6ª Edición. - Albert Paul Malvino (2000). Principios de electrónica. Ed. McGraw Hill. 6ª Edición.

Recommendations
Subjects that it is recommended to have taken before

Mathematics I/631G02151
Electricity and Electronics/631G01206
Physics I/631G02153
Informatics/631G02154
Mathematics II/631G02156
Physics II/631G02158
Subjects that are recommended to be taken simultaneously
Mathematics III/631G02260
Regulation and Control Fundamentals/631G02257
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
Networks and Communications/631G02366
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.