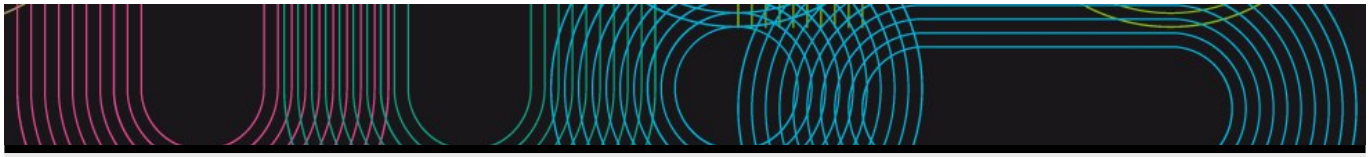

IDENTIFYING DATA				
Power electronics				
Subject	Power electronics			
Code	V12G330V01701			
Study programme	Grado en Ingeniería en Electrónica Industrial y Automática			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	4th	1st
Teaching language	Spanish Galician			
Department				
Coordinator	López Sánchez, Óscar			
Lecturers	Doval Gandoy, Jesús Gómez Yepes, Alejandro López Sánchez, Óscar			
E-mail	olopez@uvigo.es			
Web	http://moovi.uvigo.gal/			
General description	The objective of this subject is the students to learn the components and the circuits used in power electronics and to design electronic converters. They will realize practical exercises employing advanced software and instrumentation specific for power electronics.			

Skills	
Code	
B3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the scope of industrial engineering in the field of Industrial Electronic and Automation.
C22	CE22 Applied knowledge of power electronics.
C24	CE24 Ability to design analog, digital and power electronic systems.
D2	CT2 Problems resolution.
D6	CT6 Application of computer science in the field of study.
D9	CT9 Apply knowledge.
D17	CT17 Working as a team.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Understand the operation of the devices of power, his shot and his turned off.	B3	C22 C24	D2 D9
Comprise the basic appearances for the protection of the devices of power.		C22	D2 D9
Understand the basic operation of the conversion of electrical energy with electronic converters of power	B4	C22	D2 D6 D9
Purchase skills on the process of simulation of electronic converters of power.			D6 D9 D17

Contents
Topic

Introduction	Generalities. Fields of application of power electronics. Characteristics of electronic power systems.
Power electronic components	Power electronic semiconductor devices. Turn on and off of power electronic devices. Devices protection. Magnetic components in power electronics.
ac/dc converters	Diode rectifiers. Thyristor rectifiers. Interaction between the grid and the rectifier.
dc/ac converters	Basic concepts cc/ac conversion and applications. Structure of a cc/ac conversion system depending on the application. Single- and three-phase inverters. Pulse width modulation.
dc/dc converters	Basic concepts of cc/cc conversion. Structure of a cc/cc conversion system used in power supplies. Basic cc/cc conversion topologies.
Practices of power electronic semiconductors	Simulation with PSIM and realization of circuits for the study of power semiconductors of power: diodes, thyristors, transistors.
Practices of ac/cd converters	Simulation with PSIM and realization of ac/dc converters.
Practices of dc/ac converters	Simulation with PSIM and realization of dc/ac converters.
Practices of dc/dc converters	Simulation with PSIM and realization of dc/dc converters.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	21	0	21
Problem solving	9.5	9.5	19
Laboratory practical	18	0	18
Autonomous problem solving	0	35	35
Previous studies	0	55	55
Essay questions exam	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

	Description
Lecturing	They will develop in the schedules fixed by the direction of the centre. They will consist in an exhibition by part of the professor of notable appearances of the matter that will be related with the matters that previously had to work the student. In this way favourable the active participation of the same, that will have occasion to expose doubts and questions during the session.
Problem solving	They will develop in the schedules fixed by the direction of the centre. When it result timely or notable will proceed to the resolution of examples and/or problems that illustrate properly the problematic to treat.
Laboratory practical	During the sessions of practices the students will realise activities of the following type: - Setting of circuits. - I handle of electronic instrumentation - Measured on circuits - relative Calculations to the setting and/or measures of *comprobación - Compilation and representation of data At the end of each session of practical each group will deliver the leaves of corresponding results.
Autonomous problem solving	After each theoretical session of classroom the student would have to realise, of systematic form a study of consolidation and review where would have to remain resolved all his doubts with respect to the matter. The doubts or unsolved appearances will have to expose them to the professor to the greater shortness, so that this use these doubts or questions like element of *realimentación of the process of education-learning.
Previous studies	It is absolutely indispensable that, for one correct *aprovechamiento, the student realise a previous preparation of the practical sessions of laboratory, for this will supply him indications and specific material for each session with *antelación sufficient. The student will have to work previously on the material supplied and also has to have prepared the necessary theoretical appearances to tackle the session. This previous preparation will be an element that will have very in account to the hour to evaluate each practical session.

Personalized assistance

Methodologies	Description
Laboratory practical	Students will be guided and helped by the professor staff to carry out the exercises.

Assessment

	Description	Qualification	Training and Learning Results

Laboratory practical	The practices of laboratory will evaluate of continuous way (session to session). The criteria of evaluation are: - A minimum assistance of 80%. - *Puntualidad. - Previous preparation of the practices. - *Aprovechamiento Of the session. - The practical sessions will realise in groups of two students. The billed of the practices will be the disposal of the students with *antelación. - The students answered in a group of leaves the results, that will deliver to the ending of the practice. These leaves will serve to justify the assistance and value the *aprovechamiento.	20		C22	D6 D17
Essay questions exam	It will consist in a proof written of individual and face-to-face character that will realise when finalising the *cuatrimestre, in the schedules established by the direction of the centre. The proof will be able to consist in a combination of the following types of exercises: - you Question type test. - Questions of short answer. - Problems of analysis. - Resolution of practical cases.	80	B4	C22 C24	D2 D6 D9

Other comments on the Evaluation

Evaluation will be continuous except for those students allowed by the School direction to renounce the continuous evaluation. The end-of-program call will be by single evaluation.

1. Continuous evaluation

It consists in the preparation and execution of the laboratory practices, and the realization of two tests of partial evaluation.

1.1 Laboratory practices

They will be done in groups of students and will be graded individually. The laboratory practices will be no retakeable. By the correct preparation and execution of the practices, it will be possible to obtain up to 20% of the final qualification of the subject.

1.2 Tests of partial evaluation

There will be two individual written tests of partial evaluation, in which will be possible to obtain up to 40% of the final qualification of the subject in each one of them. It will be possible to retake these tests in the second call.

1. **First partial test:** it will evaluate the contents taught to date of the test.
2. **Second partial test:** it will evaluate the remaining contents of the subject that were not included in the first test.

2. Single evaluation

It will be an individual written test consisting of theoretical questions, problems and exercises that will evaluate all the contents, theoretical and practical, of the subject.

Ethic behavior

An ethic behavior is expected from students. On the contrary (copy, plagiarism, non-permitted electronic devices, and others) the final grade will be fail (0), and the incident will be reported to the corresponding academic authorities for prosecution.

Sources of information

Basic Bibliography

Ned Mohan, Tore M. Undeland y William P. Robbins, **Electrónica de potencia: convertidores, aplicaciones y diseño.**, 3ª, McGraw-Hill, 2009

Andrés Barrado Bautista y Antonio Lázaro Blanco, **Problemas de electrónica de potencia**, 1ª, Pearson, 2007

N. Mohan, T.M. Undeland, W.P. Robbins., **POWER ELECTRONICS: CONVERTERS, APPLICATIONS AND DESIGN.**, 2ª, McGraw-Hill, 2003

M.H. Rashid, **ELECTRÓNICA DE POTENCIA: CIRCUITOS, DISPOSITIVOS Y APLICACIONES**, 2004,

S. Martínez García y J.A.Gualda Gil., **ELECTRÓNICA DE POTENCIA: Componentes, topologías y equipos**, 2006,

D.W.Hart, **ELECTRÓNICA DE POTENCIA**, 2001.,

Complementary Bibliography

Recommendations

Subjects that continue the syllabus

Industrial electronics/V12G330V01924
Final Year Dissertation/V12G330V01991

Subjects that are recommended to be taken simultaneously

Electronic instrumentation 2/V12G330V01921
Real-time control systems/V12G330V01913

Subjects that it is recommended to have taken before

Fundamentals of electronics/V12G330V01402
Digital electronics and microcontrollers/V12G330V01601
Three-phase systems and electrical machines/V12G330V01505
Digital electronic systems/V12G330V01923

Other comments

To enrol in this subject is necessary to surpass or be enrolled in all the subjects of lower courses.

Castilian and English versions of this guide are a translation of the original Galician version. In case that, by mistake, differences among them exists the Galician version prevails.