



IDENTIFYING DATA

Power electronics

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	#EnglishFriendly Spanish Galician			
Department				
Coordinator	López Sánchez, Óscar			
Lecturers	Doval Gandoy, Jesús López Sánchez, Óscar			
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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.			
International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.				

Training and Learning Results

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.

Expected results from this subject

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/dc 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	20	0	20
Problem solving	8.5	9.5	18
Laboratory practical	18	0	18
Autonomous problem solving	0	35	35
Previous studies	0	55	55
Essay questions exam	2	0	2
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 the professor of key issues of the subject, which will be connected with previous subjects. In this way, active participation of the student will be favored, who will have the opportunity to expose doubts and questions during the session.
Problem solving	They will develop in the schedules fixed by the direction of the centre. When appropriate, examples and/or problems illustrating the items under study will be solved.
Laboratory practical	During the lab sessions the students will perform the following activity types: <ul style="list-style-type: none"> - Circuits wiring. - Handling of electronic instrumentation - Measuring in circuits - Calculations about the circuits and verification measurements - Compilation and representation of data At the end of each session of practical each group will report the obtained results.
Autonomous problem solving	After each theoretical session, the student should do a systematic review of the topics and all their questions should get clarified. It is recommended solve problems about each topic. In this regard, a book with step-by-step solution of the problems is provided.
Previous studies	To take full advantage of theoretical and lab lessons, it is necessary their previous preparation. Guidance and documentation will be timely provided by the teachers. Previous preparation of lab section will be qualified.

Personalized assistance

Methodologies	Description
Lecturing	Student could apply for individual or group tutorials through the online teaching platform.
Laboratory practical	Students will be guided and helped by the professor staff to carry out the exercises.

Assessment

Description	Qualification Training and Learning Results
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Laboratory practical	Lab exercises will be evaluated session-by-session. The evaluation criteria are the following: - Previous preparation of the session. - Timely assistance. - Report. Non assistance or missing report will be qualified with zero (0). Cannot be retaken. A lab qualification obtained in one of the two previous years with a mark greater than 30% in essay question exams can be kept.	20		C22	D6 D17
Essay questions exam	First partial exam. It can include the following: - Test questions. - Short answer questions. - Analysis problems. - Solution of practical cases. It comprises the topics studied until the exam date. It can be retaken in the extraordinary evaluation call.	40	B4	C22 C24	D2 D6 D9
Essay questions exam	Second partial exam. It can include the following: - Test questions. - Short answer questions. - Analysis problems. - Solution of practical cases. It comprises the topics not included in the first partial exam. It will be in the date set by the School for the final exam. It can be retaken in the extraordinary evaluation call.	40	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 global assessment.

The global assessment consist in a written exam (80%) with theoretical questions, problems and exercises, which evaluate all topics of the subject, and a practical exam carried out in the lab (20%).

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.
