DEGREE CURRICULUM

POWER ELECTRONICS

Coordination: GARRIGA CASTILLO, JUAN ANTONIO

Academic year 2016-17

POWER ELECTRONICS 2016-17

Subject's general information

Subject name	POWER ELECTRONICS
Code	102122
Semester	2nd Q(SEMESTER) CONTINUED EVALUATION
Typology	<table><tr><th>Degree</th><th>Course</th><th>Typology</th><th>Modality</th></tr><tr><td>Bachelor's Degree in Automation and Industrial Electronic Engineering</td><td>3</td><td>COMPULSORY</td><td>Attendance-based</td></tr></table>
ECTS credits	6
Groups	1GG,4GP
Theoretical credits	3
Practical credits	3
Coordination	GARRIGA CASTILLO, JUAN ANTONIO
Department	INFORMATICA I ENGINYERIA INDUSTRIAL
Teaching load distribution between lectures and independent student work	60h of class 90h of autonomous work 1 ECTS = 10h of class + 15 h of autonomous work
Important information on data processing	Consult this link for more information.
Language	Català 20.0 Castellà 80.0
Office and hour of attention	Tuesday 19:00 - 21:00 h / Office 2.18, 2.19 entry

POWER ELECTRONICS 2016-17

Professor/a (s/es)	Adreça electrònica professor/a (s/es)	Crèdits	Horari de tutoria/lloc
GARRIGA CASTILLO, JUAN ANTONIO	garriga@diei.udl.cat	7,2	

Subject's extra information

Power Electronics requires other skills acquired in areas such as subjects of Electrical Technology, Circuit Theory and Fundamentals of Electronic Engineering. Computer skills are interesting and practical use of advanced applications in personal computers since it offers good support for mathematical analysis and systems simulation

Power Electronics is a course of six mandatory ECTS credits, taught in the second quarter of the third course of Engineering Degree in Industrial Electronics and Automation. This course introduces students to the analysis and design of power electronic systems for industrial applications with emphasis on semiconductors power most used, switched power converters (ac / dc, dc / dc, dc / ac, ac / c) in its various topologies and feeding different loads, as well as provide a comprehensive overview of the many fields of application of this discipline.

Learning objectives

- Acquire a vision of power electronics.
- Knowing several types of power semiconductor devices and switching characteristics.
- Learning classes of power converters.
- Use basic circuit analysis techniques to analyze the performance of circuits in power electronics.
- Graphical and analytical understanding of the functioning of electronic power circuits.

Competences

Cross - disciplinary competences

- **EPS1**. Capacity to solve problems and prepare and defence arguments inside the area of studies.
- **EPS6**. Capacity of analysis and synthesis

Specific competences

- **GEEIA20.** Knowledge of the basics and applications of the analogue electronics.
- **GEEIA21.** Knowledge of the basics and applications of the digital electronics and microprocessors.
- **GEEIA22.** Applied knowledge of power electronics.
- **GEEIA23.** Applied knowledge of electronic instrumentation
- **GEEIA24.** Capacity to design analogue, digital and power electronic systems.

Subject contents

1. Introduction to Power Electronics

2. Power Semiconductors

    2.1. Diode.
    2.2. Thyristor.
    2.3. GTO

2.4. TRIAC
2.5. Bipolar Transistor
2.6. MOSFET
2.7. IGBT

3. Converters

3.1. Conversion of alternating current-direct current (AC / DC)
3.2. Conversion of alternating current-alternating current (AC / AC)
3.3. Conversion of direct current-direct current (DC / DC)
3.4. Conversion of direct current-alternating current (DC / AC)

4. Applications of Power Electronics

Methodology

Classroom activities are divided into three parts: lectures, problem solving and practices.

- **Lectures:** In the lectures the contents of the subject are presented orally by a lecturer without the active participation of students.
- **Troubleshooting**: In the problem-solving activity, the teacher presents a complex issue that students must solve, either working individually or in teams.
- **Practices**: Let you apply and configure a practical level, the theory of a field of knowledge in a particular context.

The non-contact activities are divided into two parts: strengthen their knowledge autonomously based on the teaching material provided or recommended by the teacher, and reporting on the development of practices.

Development plan

Week	Methodology	Temary	Contact hours	Independent work hours
1	Master class problems	Tema1	4 h	6 h
2-3	Master class Simulation Practices	Tema 2	8 h	12 h
4	Master class problems	Tema 3	4 h	6 h
5-6	Master class Simulation Practices	Tema 3	8 h	12 h
7-8	Master class problems	Tema 3	8 h	12 h
9	Written test Delivery practices	Tema 1 a Tema 3 Practices	2 h	
10-11	Master class Simulation Practices	Tema 3	8 h	12 h
12	Master class problems	Tema 3	4 h	6 h

13-14	Master class Simulation Practices	Tema 3	8 h	12 h
15	Master class problems	Tema 4	4 h	6 h
16	Written test Delivery practices	Tema 3 a Tema 4 Practices	2 h	

During the first weeks of the course theory classes and problems of the first issue were developed, and then the practice sessions developed for the issue began.

This development plan will be conducted throughout the course, so, practices will be held once acquired knowledge to carry them out.

The corresponding practical reports will be delivered as the same day deadline set for the completion of the partial examination, must contain the theoretical results and simulated practices made to date.

Evaluation

To pass the course requires passing practices.
Theory (Examinations) 70%, the minimum score on each test to make half will be 4 out of 10. Minimum mark of theory to pass the course in May.

Practices (Assistance + Reporting) 20%, reports should contain the relevant practice analysis, simulation and the empirical data.

Non-contact work (collection of solved problems) 10%

INSTRUCTIONS FOR THE CORRECT DEVELOPMENT REVIEW

Present the DNI / Passport in the test.

Always follow the instructions of the teacher in the allocation of seats to fill.

Leave necessarily always visible on the table ID / Passport, writing utensils and possible materials authorized for testing.

Leave folders, bags and / or backpacks where the professor noted.

Mobile phones or any telecommunications device must be disconnected and stored in bags or backpacks. The use of these devices and some other unauthorized material is strictly forbidden. If it detects that a student has activated, it will be expelled from the examination with the consequences arising.

You can not answer pencil, nor red or green ink.

While performing tests all students must have the pinna (ear) discovered for verification that they are not using hearing aids not allowed. During the exam students must always have both hands visible.

Correction and absolute silence during the examination.

The teacher may expel any student test violates these standards, with the consequences arising.

GENERAL CRITERIA FOR THE CORRECTION OF TESTS

If you consider a section divided in approach ("We ..." "You ask ..."), development ("The application of Theorem with this hypothesis allows ...") and resolution ("In the expression of the theorem is replaced ... and simplifying get ... ") until the result, to gain score paragraph must be presented in an orderly and intelligible development.

One result is rejected if the source, that is to present a coherent development with the statement (no need to make an explicit approach, or copy or recreate the statement) is not indicated.

For maximum score is required, where applicable:

- Getting the correct numerical result with SI units (International System).
- Presenting graphic indicating the scales with correct units.
- Present schemes, block diagrams, etc. unambiguously.
- Pulchritude, conciseness, accuracy and clarity of presentation will be highly valued.

It is heavily penalized so could nullify the score in a section:

- The dimensional and conceptual errors in reasoning.
- The results without units or SI units are not.
- The numerical errors that lead to reasonable results only slightly penalized.
- Other numerical errors can become considered misconceptions.
- In chained questions are not heavily penalized errors arising from the above results, provided that taking these as data does not represent a conceptual error and the results derived are reasonable.

Bibliography

Título: ELECTRÓNICA DE POTENCIA: CIRCUITOS, DISPOSITIVOS Y APLICACIONES.
Autor/es: Muhammad H. Rashid;
Editorial: : PEARSON / PRENTICE HALL

Título: FUNDAMENTALS OF POWER ELECTRONICS
Autor/es: Erickson, Robert W. ; Maksimovic, Dragan ;
Editorial: Springer

Título: Power Electronics: Converters, Applications and Design
Autor/es: N. Mohan, T. M. Undeland y W. P. Robbins
Editorial: John Wiley and Sons

Título: ELECTRÓNICA DE POTENCIA
Autor/es: Hart, Daniel ;
Editorial: PEARSON

Título: ELECTRÓNICA DE POTENCIA. Principios fundamentales y Estructuras Básicas
Autor/es: Eduard Ballester, Robert Piqué ;

POWER ELECTRONICS 2016-17

Editorial: MARCOMBO UNIVERSITARIA

Título: ELECTRÓNICA DE POTENCIA. COMPONENTES, TOPOLOGÍAS Y EQUIPOS
Autor/es: Martínez García, Salvador ; Gualda Gil, Juan Andrés;
Editorial: THOMSON PARANINFO,S.A.

Título: PROBLEMAS DE ELECTRÓNICA DE POTENCIA
Autor/es: Andres Barrado, Antonio Lázaro ;
Editorial: : PRENTICE HALL