Universidad Zaragoza

Academic Year/course: 2021/22

30394 - Power Electronics

Syllabus Information

Academic Year: 2021/22
Subject: 30394 - Power Electronics
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 581 - Bachelor's Degree in Telecomunications Technology and Services Engineering
ECTS: 6.0
Year: 4
Semester: First semester
Subject Type: Optional
Module:

1. General information

1.1. Aims of the course

The main objective of the power electronics subject is to provide a complete overview of power conversion techniques in telecommunications equipment. Currently these circuits are a fundamental part of telecommunications systems and require more attention every day.

They are also part of the new technologies (integration of renewables, harvesting of energy in wireless networks, efficient RF amplification,...) which enable the deployment of efficient and cost-effective networks.

Finally, the aim is to train the student of the necessary intuitive reasoning: circuital knowledge, harmonic analysis, power calculations.

1.2. Context and importance of this course in the degree

Power Electronics is part of the core competencies of a degree in telecommunications. All universities incorporate power conversion techniques in their curriculum, since they are a very relevant part of the costs of deploying networks and systems. And, in the near future, they will be part of the enabling technologies for the new ICT paradigms.

Within the specialty "Power Electronics" is part of the subject "Analog", along with Electronic Instrumentation forms in analog techniques and knowledge.

1.3. Recommendations to take this course

It is advisable to have studied and passed Fundamentals of Electronics and Analog Electronics.

2. Learning goals

2.1. Competences

CSE1 Ability to build, operate and manage systems for capturing, transporting, representing, processing, storing, managing and presenting multimedia information, from the point of view of electronic systems.

CSE3 Ability to perform the specification, implementation, documentation and tuning of equipment and systems, electronic, instrumentation and control, considering both the technical aspects and the corresponding regulatory regulations.

CSE4 Ability to apply electronics as a support technology in other fields and activities, and not only in the field of Information and Communications Technologies.

CSE5 Ability to design analog and digital electronics circuits, analog-digital and digital and analog conversion, radio frequency, power and electrical energy conversion for telecommunications and computing applications.

CSE6 Ability to understand and use feedback theory and electronic control systems.

CSE8 Ability to specify and use electronic instrumentation and measurement systems.

CSE9 Ability to analyze and solve interference and electromagnetic compatibility problems

2.2. Learning goals

Identifies the applications and functions of power electronics in Engineering.

? Analyzes and designs electronic power stages in direct and alternating current.

? Know the technological fundamentals, models and selection criteria of power semiconductor devices.

? It has the ability to apply control and protection circuits to power devices in the stages.

? It is able to classify, knowing how to characterize and select radio frequency power amplifiers from the point of view of energy processing.

? Know the problem of nonlinearity and its effects on a power amplification chain.

? Analyzes and designs radio frequency power amplifier stages from the point of view of energy processing.

? Handles with ease the equipment and instruments of a power electronics laboratory.

2.3. Importance of learning goals

Power Electronics, as a discipline of energy management, is present in all telecommunications systems, equipment and services. It is also one of the dependent technologies of the future.

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The subject approaches Power Electronics from the practical and applied perspective. Ac-DC, DC-DC and amplification (DC-AC) conversion circuits are part of small topologies that will be developed together with application examples.

Simple design challenges are proposed, but they include all the essential elements for the understanding of Power Electronics, at a basic level, for the selection, design and maintenance of Telecommunications Equipment.

4.2. Learning tasks

A01 Master Class 15 hours

A02 Troubleshooting and cases 30 hours

A03 Laboratory practices 15 hours

A05 Carrying out practical application or research work 25 hours

4.3. Syllabus

Introduction to power electronics: applications, functions and devices. Electronic power stages. AC-DC converters (rectifiers). DC-DC converters. DC-AC converters (inverters) and AC-AC. Resonant converters: generalities. Power electronics. Power diodes and thyristors. Power transistors. Other power devices. Control and protection circuits.

4.4. Course planning and calendar

Activities will pe planned as stated in EINA rules.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=30394