

29822 - Power Electronics

Syllabus Information

Academic year: 2023/24

Subject: 29822 - Power Electronics

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

326 - Escuela Universitaria Politécnica de Teruel

Degree: 330 - Complementos de formación Máster/Doctorado

440 - Bachelor's Degree in Electronic and Automatic Engineering

444 - Bachelor's Degree in Electronic and Automatic Engineering

ECTS: 6.0

Year: 440 - Bachelor's Degree in Electronic and Automatic Engineering: 3

444 - Bachelor's Degree in Electronic and Automatic Engineering: 3

330 - Complementos de formación Máster/Doctorado: XX

Semester: First semester

Subject type: 440 - Compulsory

330 - ENG/Complementos de Formación

444 - Compulsory

Module:

1. General information

The subject aims at understanding the fundamentals and applications of power electronics, through the knowledge of power electronic stages and devices and their main applications to industrial, domestic, communications and medical systems. In addition, familiarization with the instrumentation of a power electronics laboratory and some practical applications is pursued.

These approaches and objectives are aligned with the Sustainable Development Goals (SDGs) of the 2030 Agenda of United Nations (<https://www.un.org/sustainabledevelopment/es/>) and certain specific targets, such that the acquisition of the learning results of the subject will contribute to some extent to the achievement of targets 7.2 and 7.3 of Goal 7, of targets 8.2 and 8.4 of Goal 8, and of target 9.5 of Goal 9.

2. Learning results

- Identify the functions and applications of power electronics.
- Analyze and design power electronic stages with direct and alternating voltages and currents.
- To know the technological fundamentals, models and selection criteria of power semiconductor devices.
- Apply control and protection circuits to power devices in stages.
- Use computer simulation tools applied to power electronic circuits.
- Handle the equipment and instruments used in a power electronics laboratory.

3. Syllabus

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Introduction:

- Introduction to power electronics.

Electronic power stages:

- AC-DC converters (rectifiers).
- DC-DC converters.
- DC-AC (inverters) and AC-AC converters.
- Resonant converters: general information.

Power electronic devices:

- Power diodes and thyristors.
- Power transistors.
- Other power devices and integrated circuits.

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- Power components.
- Thyristors and triacs.
- Controlled rectifiers (AC-DC conversion).
- IGBT transistors.
- DC-DC converters.
- DC-AC converters.

4. Academic activities

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- Lectures (30 hours).
- Problem solving and case studies (15 hours).
- Laboratory practices (13 hours).
- Special practices (2 hours).
- Teaching assignments (27 hours).
- Study (60 hours).
- Assessment tests (3 hours)

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5. Assessment system

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The assessment system will include the following activities:

- Final written exam: it will consist of theoretical-practical questions and problems. To be held at official calls. The correctness of the answers and the development of analysis, designs and numerical results will be assessed . It will be graded from 0 to 7 points (C1) and will represent 70% of the total grade. To pass the subject, must obtain a minimum grade in this section of 3 points out of 7.
- The assessment of laboratory practices and associated work: the work associated with the practices will be evaluated, as well as the ability to assemble or simulate electronic circuits and the handling of the instruments in the laboratory. The work associated with each laboratory practice will consist of the preparatory exercises prior to the practice, to prepared before the session, and the report of the results of the corresponding practical session. It will be graded from 0 to 3 points (C2) and will represent 30% of the total grade. In order to pass the subject, a minimum grade of 1 point out of 3 must be obtained in this section . If preferred, a laboratory exam may be taken at the official calls, which will also be graded from 0 to 3 points (C2) and will account for 30% of the totalgrade.

The total grade for the subject (out of 10 points) will be $C1 + C2$, provided that $C1$ is greater than or equal to 3 and $C2$ is greater or equal to 1. Otherwise, the total grade for the course will be the minimum between $C1 + C2$ and 4. The subject is passed with a total grade higher or equal to 5 points out of 10.

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Students will be able to choose among the following assessment alternatives:

- 100% grade corresponding to the grade of the final written exam.
- 80% of the grade corresponding to the grade of the final written exam and the remaining 20% associated with the score obtained in the practices and proposed works.

In both cases, the final exam will be composed of theoretical-practical questions and problems. It will be held at the official calls. The correctness of the answers and the development of analysis, designs and numerical results will be assessed.

In the laboratory practices and associated work, the ability to assemble or simulate electronic circuits and the interpretation of the results obtained will be assessed. The work associated with each laboratory practical, to be handed in by the students after the practical session, will consist of the preparatory exercises prior to the session, and the report of the results of the corresponding practical session.

The students who decide that the practicals will not be graded, will have to do all the practicals of the subject or pass a laboratory exam whose grade will be simply pass or fail.