

60819 - Power and Digital Electronics

Syllabus Information

Academic year: 2023/24

Subject: 60819 - Power and Digital Electronics

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 532 - Master's in Industrial Engineering

ECTS: 6.0

Year:

Semester: First semester

Subject type: Optional

Module:

1. General information

This subject offers an integrative vision using digital electronics for the management of power electronic circuits for industrial applications. It starts from the basic applications and functions of each discipline, introduces digital design with microcontrollers, and provides an overview of the most commonly used power electronic stages in the industry.

Currently, no industrial system or process is conceived without the intervention of electronic systems for sensing variables, processing information, and handling actuators. This subject completes the basic overview of electronics obtained in the previous degree with an introduction to microcontrollers and the applications, functions and stages of power electronics. This will help the student to confidently approach the subsequent subject of Electronic Design and Advanced Control of the master's degree, as well as the related elective subjects.

2. Learning results

Upon completion of the subject, the student will be able to design different basic power electronics systems and control them using a microcontroller.

3. Syllabus

The following topics will be studied in the classroom:

1. Fundamentals of power electronics.
2. Conversion stages: DC-DC, DC-AC, AC-AC and AC-DC.
3. Power electronic technologies.
4. Fundamentals of microcontrollers.
5. Design of electronic systems with microcontroller.

All of them will be explored in the lab through 5 practices:

1. Simulation and assembly of DC-DC converters.
2. Simulation and demonstration of inverters.
3. Introduction to microcontroller design.
4. Speed variation of a motor using PWM with microcontroller.
5. Light intensity control of a lamp using a thyristor.

4. Academic activities

In class, the "challenge problem method" will be used. In it, the teacher will present challenges based on different scenarios or applications where the use of power electronics devices is necessary. The teacher will guide the student in the search for the appropriate solution. In the practical sessions, part of the solutions to the challenges presented in class will be experimentally validated.

5. Assessment system

Theoretical-practical written exam

It will include theoretical-practical questions and problems and will be carried out in each of the two official calls.

CT grade from 0 to 10 points. It will represent 75% of the student's grade in the subject.

Laboratory practices

They will be evaluated through observation of the students' work in the laboratory and through analysis of the prior preparatory work.

Grading from 0 to 10 points will represent 25% of the student's overall grade.

Laboratory exam

To be carried out in each of the two official calls by students who have obtained a grade below 4 in the laboratory practices during the term. The exam will consist of implementing circuits and systems similar to those developed during the term in the laboratory practice sessions.

Grading from 0 to 10 points will represent 25% of the student's overall grade.

The overall CL practice grade will be the highest of the practice grades obtained during the term and the laboratory exam grade. If the student has obtained a CL grade equal to or greater than 4 points, the subject grade will be $(0.25 \times CL + 0.75 \times CT)$. Otherwise, the total grade for the subject will be the minimum between 4 and the result of applying the previous formula.

The subject is passed with a total grade higher than or equal to 5 points out of 10.