

## 30028 - Power Electronics

### Syllabus Information

**Academic year:** 2023/24

**Subject:** 30028 - Power Electronics

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 436 - Bachelor's Degree in Industrial Engineering Technology

**ECTS:** 6.0

**Year:** 3

**Semester:** Second semester

**Subject type:** Compulsory

**Module:**

### 1. General information

This subject offers an integrative vision using digital electronics for the management of power electronic circuits for industrial applications. The basic applications and functions of each discipline are discussed, digital design with microcontrollers is introduced and an overview of the most widely used powerelectronics stages in the industry is given.

These approaches and objectives are aligned with some of the Sustainable Development Goals, SDGs, of the Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>) and certain specific goals, so that the acquisition of the learning results of the subject provides training and competence to the student to contribute to some extent to their achievement:

Goal 7: Affordable and Clean Energy

Goal 9: Industry, innovation and infrastructure.

Goal 13: Take Urgent Action to Combat Climate Change and its Impacts.

### 2. Learning results

The learning results are:

Identify the applications and functions of power electronics in engineering.

Analyze and design power electronic stages in direct and alternating current.

- Apply and design digital electronic circuits for the control of electronic power stages.

- Know the models and selection criteria for power semiconductor devices and programmable logic devices.

Handle with ease the equipment and instruments of an analog electronics laboratory.

To know how to use computer simulation tools applied to analog electronic circuits.

Understand the social, environmental, economic and industrial advantages of power electronics.

### 3. Syllabus

The syllabus includes the following units...

1- Fundamentals of microcontrollers.

2- Design with the MSP430 family of microcontrollers.

3- Fundamentals of power electronics.

4- DC-DC converters.

5- DC-AC and AC-AC converters.

6- Rectifiers.

7- Power electronic technologies.

In addition, 5 laboratory practices of 3 hours of duration each will be carried out:

P1-Introduction to microcontroller design.

P2-Speed variation of a motor using PWM with microcontroller.

P3-Simulation and assembly of DC-DC converters.

P4-Simulation and demonstration of inverters.

P5-Light intensity control of a lamp by thyristor.

### 4. Academic activities

The planned activities are:

**Face-to-face** activities: 2.4 ECTS (60 hours)

A01 Lectures: approximately 30 hours.

A02 Problem solving and case studies in the classroom: approximately 15 hours.

A03 Laboratory practices: 15 hours

**Non-face-to-face** activities: 3.6 ECTS (90 hours)

A06 Teaching assignments and their supervision: approximately 30 hours. It includes the preparation of the preparation work for the practices, as well as the preparation of the practice reports.

A07 Study: approximately 60 hours. It includes personal study, preparation of practices and tutorials.

A08 Evaluation tests. approximately 5 hours. It includes the completion of the exam and the review of the papers and the exam grades.

## 5. Assessment system

The subject will be assessed in the **global** assessment modality by means of the following activities:

### **E1 Open answer written test:**

Composed of theoretical-practical questions and/or problems. It will be scheduled on the official exam dates and will award the CT grade from 0 to 10 points.

### **E2 Laboratory practical exam**

Students who have obtained a grade lower than 4 points in the continuous assessment of practices during the term will be required to take a laboratory exam to be held after the written test and must hand in all work related to the practicals.

The practicals will be evaluated continuously throughout the course by means of the assessment of the previous preparatory work, the laboratory work and the post-practicals reports elaborated during the term.

This part awards the CL grade from 0 to 10 points.

### **Subject grading**

The final practical CL grade will be the maximum of the practical grade during the term and the grade of the practical laboratory exam. If the student has obtained a CL grade higher or equal to 4 points and a CT grade higher or equal to 4 points, the overall grade will be  $(0.25 \times CL + 0.75 \times CT)$ . Otherwise, the overall grade will be the minimum between 4 and the result of applying the above formula.

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