

30028 - Power Electronics

Syllabus Information

Academic year: 2024/25

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 power electronics stages in the industry is given.

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 course will be assessed in the global assessment mode, but two intermediate tests will be scheduled during the academic period to facilitate the gradual passing of the course.

Assessment throughout the semester:

Written test in the middle of the semester on topics 1 and 2. This test will award the grade P1, which must be 4.5 or higher (out of 10) to continue with this type of assessment.

Written test at the end of the semester on the remaining subjects. This test awards the grade P2, which must be 4.5 or higher (out of 10) to continue with this type of assessment.

Passing any of these tests does not eliminate content for the overall test.

Laboratories grade: CL. must be 4 or higher (out of 10) to continue with this type of assessment The laboratories will be assessed through analysis of the preparatory work, the work in the laboratory, and the end reports produced throughout the course.

Using gradual assessment, the overall grade for the course is obtained as follows: $0.2 \times CL + 0.3 \times P1 + 0.5 \times P2$. Otherwise, the overall grade will be the minimum between 4 and the result of applying the above formula.

The overall test will consist of the following activities:

Open-response written test: Composed of theoretical-practical questions and/or problems. It will be scheduled in the official exam sessions and will award the grade CT from 0 to 10 points.

Observation and analysis of laboratories: Students who have obtained a practical grade of less than 4 points during the course must hand in all the work related to the practical and must take a laboratory exam to be held after the open-response written test.

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

Grading of the course:

The final practical CL grade will be the maximum of the laboratory grade during the course and the grade of the 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 of the subject will be $(0.2 \times CL + 0.8 \times CT)$. Otherwise, the overall grade will be the minimum between 4 and the result of applying the above formula.

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

6. Sustainable Development Goals

7 - Affordable and Clean Energy
9 - Industry, Innovation and Infrastructure
13 - Climate Action