Universidad Zaragoza

Academic Year/course: 2021/22

30028 - Power Electronics

Syllabus Information

Academic Year: 2021/22
Subject: 30028 - Electrónica digital y de potencia
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

1.1. Aims of the course

The course is focused on providing training in digital electronics and power electronics for industry applications. The design of the proposed course includes both lectures and laboratory sessions. Topics include an overview of the MSP430 microcontroller, power electronics converters and several electronic technologies involved in industry applications.

1.2. Context and importance of this course in the degree

Electronic Engineering is a key enabling discipline which is involved in main research and development fields of current societies. Electronics are in the heart of many industry applications focused on efficient energy conversion, as electrical mobility, renewable energies and electrical drives.

1.3. Recommendations to take this course

It is convenient previous background in programming languages, circuit theory and basic electronics.

2. Learning goals

3. Assessment (1st and 2nd call)

3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

Course grading
The course is assessed according to the following items:
Final exam mark CT, from 0 to 10 points, has a weight of 75% in the final mark.
Laboratory classes mark CL, from 0 to 10 points, has a weight of 25% in the final mark.
The final mark (CG) is obtained using the following equations:
CGaux = 0.25xCL + 0.75xCT
CG = CGaux if (CL>=4 and CT>=4), otherwise CG=min{4, Cgaux}

You need a final mark greater than or equal to 5 to pass the course.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. It is based on participation and the active role of the student favors the development of communication and decision-making skills. A wide range of teaching and learning tasks are implemented, such as lectures, guided assignments, laboratory sessions, autonomous work, and tutorials.

Students are expected to participate actively in the class throughout the semester.

Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

Further information regarding the course will be provided on the first day of class.

4.2. Learning tasks

The course includes 6 ECTS organized according to:

- Lectures (1.8 ECTS): 45 hours.
- Laboratory sessions (0.6 ECTS): 15 hours.
- Guided assignments (1 ECTS): 25 hours.
- Autonomous work (2.4 ECTS): 60 hours.
- Assessment (0.2 ECTS): 5 hours.

Notes:

Lectures: the professor will explain the theoretical contents of the course and solve illustrative applied problems. These problems and exercises can be found in the problem set provided at the beginning of the semester.

Laboratory sessions: sessions will take place every 2 weeks (5 sessions in total) and last 3 hours each. Students will work together in groups actively doing tasks such as simulations, practical demonstrations, measurements, calculations, and the use of graphical and analytical methods.

Guided assignments: students will complete assignments related to concepts seen in laboratory sessions and lectures.

Autonomous work: students are expected to spend about 60 hours to study theory, solve problems, prepare lab sessions, and take exams.

Tutorials: the professor's office hours will be posted on Moodle and the degree website to assist students with questions and doubts. It is beneficial for the student to come with clear and specific questions.

4.3. Syllabus

The course will address the following topics:

Lectures

Topic 1. Fundamentals of Microcontrollers (6 hours)

Topic 2. Digital Design with the MSP430 Microcontroller Family (8 hours)

Topic 3. Fundamentals of Power Electronics (5 hours)

Topic 4. 1. DC-DC Power Converters (5 hours)

Topic 5. 2. DC-AC and AC-AC Power Converters (6 hours)

Topic 6. Rectifiers (6 hours)

Topic 7. 4. Power Electronics Technologies (8 hours)

Laboratory sessions

Session 1. Introduction to the Design with Microcontrollers

Session 2. PWM Motor Speed Control with Microcontroller

Session 3. DC-DC Converters: Simulation and Hands-On

Session 4. Power Inverters Simulation and Demo

Session 5. Lamp Dimmer with a Microcontroller Driven Thyristor

4.4. Course planning and calendar

For further details concerning the timetable, classroom and further information regarding this course, please refer to the Escuela de Ingeniería y Arquitectura de la Universidad de Zaragoza (EINA), website, https://eina.unizar.es/.

4.5. Bibliography and recommended resources

Link:

<--?PHP echo "http://biblos.unizar.es/br/br_citas.php?codigo=".$codasig."&year=2020"; ?-->