67236 - FPGA-based digital control for power converters

Información del Plan Docente

Academic Year	2017/18
Faculty / School	110 - Escuela de Ingeniería y Arquitectura
Degree	527 - Master's in Electronic Engineering
ECTS	6.0
Year	1
Semester	First semester
Subject Type	Optional
Module	---

1.General information

1.1.Introduction

1.2.Recommendations to take this course

1.3.Context and importance of this course in the degree

1.4.Activities and key dates

2.Learning goals

2.1.Learning goals

2.2.Importance of learning goals

3.Aims of the course and competences

3.1.Aims of the course

3.2.Competences

4.Assessment (1st and 2nd call)

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

The final grade for this course is based on the following weighting:

- Final exam (50 % of grade)
- Pre-lab work, attendance, attitude, and accomplishment during laboratory session (30 %)
- Laboratory reports (20 %)

5.Methodology, learning tasks, syllabus and resources

5.1.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 that favor 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.

5.2.Learning tasks

The course includes 6 ECTS organized according to:

- Lectures (1.48 ECTS: 37 hours).
- Laboratory sessions (0.72 ECTS: 18 hours).
- Tutorials for assignment supervision (0.2 ECTS: 5 hours).
- Guided assignments (1.52 ECTS: 38 hours).
- Autonomous work (2.0 ECTS: 50 hours).
- Assessment (0.08 ECTS: 2 hours).

5.3.Syllabus

The course will address the following topics:

Lectures

Topic 1. Design with FPGA for power electronic converters.

Topic 2. Arithmetic and VHDL coding.

Topic 3. VHDL modeling of power electronic converters for testbench generation.

Topic 4. FPGA-based gate signal generation for power electronic converters.

Topic 5. VHDL description of digital controllers for power electronic converters.

Laboratory sessions

Session 1. FPGA interface to a 1-wire temperature sensor. Simulation + practical work.

Session 2. FPGA interface to an A / D converter. Simulation + practical work.

67236 - FPGA-based digital control for power converters

Session 3. VHDL Modeling of a buck converter. Simulation.

Session 4. FPGA-Based Sigma-delta modulator. Simulation + practical work.

Session 5. Digital Control of a Buck converter I. Simulation.

Session 6. Digital control of a Buck Converter II. Simulation + hands-on.

5.4.Course planning and calendar

Lectures run for 2 or 3 weekly hours. Laboratory sessions will take place every 2 weeks (6 sessions in total) and last 3 hours each.

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the EINA website (eina.unizar.es).

5.5.Bibliography and recommended resources

Basic bibliography could be found in the library website.

Basic Bibliography

- J.I. Artigas, L.A. Barragán, C. Orrite, I. Urriza, "Electrónica Digital. Aplicaciones y problemas con VHDL", Prentice-Hall, 2002.
- L. Corradini, D. Maksimovic, P. Mattavelli, R. Zane, "Digital Control of High-Frequency Switched-Mode Power Converters", IEEE Press Series on Power Engineering, Wiley, 2015.
- S. Buso, P. Mattavelli, "Digital Control in Power Electronics", Synthesis Lectures on Power Electronics, Morgan & Claypool Publishers, 2006.