

Academic Year/course: 2022/23

29852 - Digital Design and Control with FPGA

Syllabus Information

Academic Year: 2022/23

Subject: 29852 - Digital Design and Control with FPGA

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 440 - Bachelor's Degree in Electronic and Automatic Engineering

ECTS: 6.0

Year: 4

Semester: First semester

Subject Type: Optional

Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

3.1. 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)
- Laboratory work, attendance, attitude, accomplishment during laboratory session, and reports (50 %)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the 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.

4.2. Learning tasks

The course includes 6 ECTS corresponding to 150 hours of student work, organized according to:

- Lectures (about 30 hours). Lectures run for 2 weekly hours. The teacher explains the course contents and solves representative applied problems. These problems and exercises can be found in the problem set provided at the beginning of the course. Regular attendance is highly recommended.
- Laboratory sessions (about 30 hours). Laboratory sessions will take place every week (10 sessions in total) and they last 3 hours each.
- Autonomous work (about 84 hours). Students are expected to spend about 84 hours to study theory, solve

problems, and prepare sessions and exams.

- Assessment (about 6 hours).

4.3. Syllabus

The course will address the following topics:

Lectures

- Topic 1. Advanced concepts in VHDL
- Topic 2. Arithmetic operations in VHDL
- Topic 3. FPGA implementation of LTI discrete systems
- Topic 4. Synchronous design.
- Topic 5. FPGA architecture.

Laboratory sessions

- Interface to a 1-wire digital temperature sensor
- Asynchronous serial communication
- ADC interface
- Digital quadrature oscillator (2 sessions)
- Digital control of a Buck Converter (2 sessions)
- Embedded system with MicroBlaze

Moreover, the last 2 laboratory sessions will be dedicated to developing a free design that contains some of the circuit blocks introduced in the course: IP cores, LTI systems, and FPGA board peripherals.

4.4. Course planning and calendar

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).