

Academic Year/course: 2022/23

## 29819 - Digital Electronics

### Syllabus Information

**Academic Year:** 2022/23

**Subject:** 29819 - Digital Electronics

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura  
326 - Escuela Universitaria Politécnica de Teruel

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

**ECTS:** 6.0

**Year:** 2

**Semester:** Second semester

**Subject Type:** Compulsory

**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)

##### IN ZARAGOZA

##### Course grading

The course is evaluated according to the following items:

- Mid-term exam (CP)
- Final exam (CE)
- Laboratory exam (CL)

The final grade (CG) is obtained using the following equations:

$CG_{Gaux} = 0.8 \times CT + 0.2 \times CL$ , where  $CT = \max\{0.2 \times CP + 0.6 \times CE, 0.8 \times CE\}$ , then:

$CG = CG_{Gaux}$  if  $CL > 4$  and  $CT > 4$ , otherwise  $CG = \min\{4, CG_{Gaux}\}$

##### IN TERUEL

##### DURING THE TEACHING PERIOD

- Laboratory session and evaluation activities: maximum score 2 out of 10. They correspond to laboratory practices or assignments
- Partial theoretical-practical test: maximum score 1 point out of 10. A theoretical-practical test will be held in which the correctness of the answers, developments, designs and numerical results will be assessed.

##### OFFICIAL CALLS:

In the official calls (June and July):

- **Theoretical-practical exam:** maximum score 7 points out of 10. The correctness of the answers, developments, designs and numerical results will be assessed.

**TOTAL SCORE:** In order to pass the course, it is required that between the two theoretical-practical tests (during the teaching period + in the official call), the student obtains a score equal to or higher than 4 points.

If this requirement is met, the final grade will be the numerical sum of the scores obtained (partial theoretical-practical test + laboratory sessions and evaluation activities + final theoretical-practical exam).

If this requirement is not met, the score will be the sum of the scores obtained in the theoretical-practical tests (partial test + final).

## **GLOBAL EXAM (OFFICIAL CALLS)**

In the two official calls, the global evaluation will be carried out for those students who have not opted to be evaluated during the teaching period or who wish to improve the score obtained. On both dates the following tests will be carried out:

- Theoretical-practical exam: maximum score: 8 points out of 10. The correctness of the answers, developments, designs and numerical results will be evaluated. In order to pass the course, a minimum grade of 4 points is required in this part.
- Test on laboratory and evaluation activities: maximum score: 2 points out of 10.

**TOTAL SCORE:** In case of having obtained a grade equal to or higher than 4 points in the theoretical-practical exam, the final grade will be the sum of the two scores obtained in the global test (theoretical-practical exam + test on practices and evaluation activities). If the requirement is not fulfilled, the score will be the one obtained in the theoretical-practical exam..

## **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 favors the development of communication and decision-making skills. A wide range of teaching and learning tasks are implemented, such as lectures, exercises and problems, laboratory sessions, 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.

In the **EUPT - blended learning mode**, students will have at their disposal material adapted to follow the course in this mode. Some of the practices will be face-to-face. Others may be carried out by means of simulation programs. However, it is of vital importance that students in this modality follow the indications that will be given through Moodle.

### **4.2. Learning tasks**

**The course includes the following learning tasks:**

**In EINA, Zaragoza:**

The course includes 6 ECTS organized according to:

- Lectures (about 42 hours). Lectures run for 3 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 15 hours). Sessions will take place every 2 weeks (6 sessions in total) and they last 2.5 hours each.
- Autonomous work and study (about 87 hours).
- Assessment (about 6 hours).

**In EUPT, Teruel:**

**Lectures:** Lectures of theoretical and practical contents. The concepts and fundamentals of Digital Electronics will be presented, illustrating them with real examples. Student participation will be encouraged.

**Problem solving classes:** Problems and cases will be developed with the participation of the students, coordinated with the theoretical contents. Students are encouraged to work on the problems beforehand.

**Laboratory sessions:** The student will design, analyze, simulate, assemble and test the operation of digital circuits. He/she will have a script of the practice, which he/she will have to prepare previously.

**Assignments:** Activities that the student will carry out alone or in group and that the professor will propose throughout the teaching period.

**Study:** Personal study of the theoretical part of the course and problems. The continuous work of the student will be encouraged through the homogeneous distribution throughout the course of the various learning activities. This includes tutorials, such as direct attention to the student, identification of learning problems, guidance, attention to exercises and assignments.

**Evaluation:** In addition to the grading function, the evaluation is also a learning tool with which the student checks the degree of understanding and assimilation achieved.

**EUPT - Blended learning mode**

In the blended learning mode, the learning activities will be: Problems and cases, Laboratory practices, Teaching assignments, Study, Evaluation tests and Virtual tutorials.

### 4.3. Syllabus

**In EINA, Zaragoza:**

The course will address the following topics:

**Lectures**

- Topic 1. Fundamentals of Digital Electronics.
- Topic 2. Combinational Logic Circuits.
- Topic 3. Sequential Logic Circuits.
- Topic 4. Technologies of Digital Circuits.

**Laboratory sessions**

- Session 1. Fire-alarm circuit design.
- Session 2. BCD to Seven-segment decoder design.
- Session 3. Liquid level indicator circuit design.
- Session 4. 2-digit BCD counter design using an FPGA.
- Session 5. State-machine design using an FPGA.
- Session 6. PWM generation to control a servo motor using an FPGA.

**In EUP Teruel:**

**Syllabus:**

- Fundamentals of logic systems
- Characteristics of digital circuits
- Combinational logic
- Introduction to VHDL

- Codification and error detection
- Latches and registers
- Programmable Logic Devices
- Sequential logic
- Counters and its applications

**Laboratory sessions:**

- Properties of CMOS circuits
- Combinational circuits in VHDL
- Monostable and stables with the 555
- Sequential circuits in VHDL
- Counters in VHDL (I)
- Counters in VHDL (II)
- Design of complex systems

#### **4.4. Course planning and calendar**

Lectures run for 3 weekly hours. Laboratory sessions will take place every 2 weeks (6 sessions in total) and last 2.5 hours each.

For further details concerning the timetable, classroom and further information regarding this course, please refer to the EINA website (<http://eina.unizar.es>) in Zaragoza or EUPT in Teruel (<https://eupt.unizar.es>).

**EUPT- Blended learning mode:**

The official exams and some practices will face-to-face in the EUPT, according to the schedule indicated by the center. The rest of the activities will be carried out asynchronously, although there may be some virtual tutoring activities or tests that will be carried out synchronously, as will be announced in Moodle.