

29824 - Programmable Electronic Systems

Syllabus Information

Academic year: 2024/25

Subject: 29824 - Programmable Electronic Systems

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

326 - Escuela Universitaria Politécnica de Teruel

Degree: 330 - Complementos de formación Máster/Doctorado

440 - Bachelor's Degree in Electronic and Automatic Engineering

444 - Bachelor's Degree in Electronic and Automatic Engineering

ECTS: 10.0

Year: 440 - Bachelor's Degree in Electronic and Automatic Engineering: 3

444 - Bachelor's Degree in Electronic and Automatic Engineering: 3

330 - Complementos de formación Máster/Doctorado: XX

Semester: Annual

Subject type: 440 - Compulsory

330 - ENG/Complementos de Formación

444 - Compulsory

Module:

1. General information

The objective of Programmable Electronic Systems (SEP) is to design and program microprocessor-based electronic systems, constituting what is called an embedded system. The student will learn to design and implement microprocessor-based electronic circuits and program the control algorithms.

It is an annual subject, taught by two departments, Electronics and Communications Engineering (SEP I, fall) and Computer and Systems Engineering (SEP II, spring). To take SEP the student must know how to program (Fundamentals of computer science) and have sufficient knowledge of Fundamentals of Electronics, Digital Electronics and Automatic Systems.

2. Learning results

- Distinguish the types of memory circuits and interpret a memory map.
- Understand the structure and basic operation of a microprocessor.
- Recognize microcontrollers, DSPs and FPGAs as the most useful programmable devices in industrial electronics.
- Program programmable electronic devices and use their development tools.
- Know basic peripheral connection techniques, design its circuits and program low-level drivers.
- Design and verify digital electronic systems.
- Know how to apply time management techniques in the programming of real time systems.
- Know how to apply the implementation techniques of discrete and sampled control systems.
- Know the problems of a concurrent application.
- Know how to design and program an embedded real-time application.

3. Syllabus

1st semester (SEP I)

Digital Electronic Systems (Dept. of Electronic Engineering and Communications)

- Microprocessor-based electronic systems: basic concepts.
- Architecture and blocks of a commercial microcontroller.
- Assembler and C language programming.
- Design of interface circuits.
- Electronic devices interconnection by using serial buses: SPI, I2C, SCI.
- Design of digital electronic systems: power supply and low power.

2nd semester (SEP II).

Embedded Systems Programming (Dept. of Computer Science and Systems Engineering)

- Embedded systems development tools based on C.
- Time management and specialized peripherals.
- Programming of discrete control systems.
- Programming of sampled control systems.

- Concurrent applications. Cyclical executives.
- Real-time cores and priorities.

4. Academic activities

- **Participative lectures (50 hours).**
- **Problem and case classes (25 hours)**
- **Practices (25 horas).** The student will prepare the practice beforehand. In the session the student will assemble, program and test the operation of microcontroller-based electronic circuits.
- Personal study and work (140 hours).
- Assessment tests (10 hours)

In addition, teaching assignments could be proposed within the framework of one of the previous points (a circumstance that would be indicated during the course and through Moodle).

In addition, at the Polytechnic University School of Teruel, a subject project will be proposed that will serve as a common thread.

5. Assessment system

Annual subject divided into two parts, **SEP I (fall) and SEP II (spring), to be passed separately.**

$$\text{Final SEP grade} = 0.6 \cdot \text{SEP_I} + 0.4 \cdot \text{SEP_II}$$

Overall assessment through the Laboratory Practicals and Written Examination:

Laboratory Practices (SEP_I EINA and EUPT, and SEP_II EINA: 40%; SEP_II EUPT: 75%).

- Grading in the laboratory session and/or by exam. The previous preparation and the work of student in the session will be valued. In addition, some assignments could be proposed.
- Failure to attend a practice at the scheduled time, or not submitting a deliverable on the established date, implies a grade of 0 in that activity.
- Whoever does not achieve a **minimum of 4 out of 10** in the total of the practical part of the subject, will have to pass an **individual laboratory exam** within the framework of the official call (oral, written or in the format indicated).

Written exam (SEP_I EINA and EUPT, and SEP_II EINA: 60%; SEP_II EUPT: 25%).

- A **minimum of 4 out of 10** must be obtained.
- SEP I and SEP II will be evaluated separately on the dates established by the center (normally SEP I in January, SEP II in May, and both in the extraordinary call in June).

Note. If the minimum of 4 out of 10 is not reached in any of the parts (Practices and Exam), the final grade will be the lower of 4.0 and the weighted grade indicated above.

6. Sustainable Development Goals

- 8 - Decent Work and Economic Growth
- 9 - Industry, Innovation and Infrastructure