Universidad Zaragoza

Academic Year/course: 2023/24

30319 - Microprocessor-based Eletronics Systems

Syllabus Information

Academic year: 2023/24
Subject: 30319 - Microprocessor-based Eletronics Systems
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 438 - Bachelor's Degree in Telecommunications Technology and Services Engineering
          581 - Bachelor's Degree in Telecommunications Technology and Services Engineering
ECTS: 6.0
Year: 3
Semester: First semester
Subject type: Compulsory
Module:

1. General information

The objective of the subject is to train the student in the fundamentals of the design of electronic systems based on microprocessors, both the hardware design and the software that runs the microprocessor. The aim is to achieve analysis, design and maintenance of electronic systems based on microprocessors.

These approaches and objectives are aligned with some of the Sustainable Development Goals (SDGs) of the United Nations Agenda 2030 (https://www.un.org/sustainabledevelopment/es/). Specifically, the learning activities planned in this subject will contribute to the achievement of target 7.3 of Goal 7 and target 13.3 of Goal 13.

2. Learning results

The student, in order to pass this subject, must demonstrate the following results...

Know the basic elements and their connection, of a digital system based on microprocessor/DSP (Digital Signal Processor).

Know the structure, inner workings and performance of microprocessors/DSPs.

Program a microprocessor with ease.

Distinguish the types of memory integrated circuits available and understand their microelectronic realization.

Distinguish the types of AD/DA converter circuits available and understand their structure.

Understand high-impedance electronic technology and knows how to connect electronic devices to bus systems.

Design low complexity systems based on microcontroller studio:

- Be able to design the memory map of the system using digital integrated circuits.
- Be able to design the connection (parallel/serial/BUS access, read/write access, interrupt management) of any device in the system.
- Be capable of ensuring compliance with both time and interconnection requirements of

Be capable of designing low complexity software applications that run on the system.

Know the methods of power distribution in microcontroller systems, clock circuits and reset generator circuits.

Use with fluency the development tools of electronic systems based on microprocessors.

Use the technical documentation of the microprocessor under study, and of the memories and other integrated circuits used.

3. Syllabus

Theoretical program:

- Introduction to Microprocessors. Programming in C.
- Architecture and model of a microprocessor programmer.

- Representation of numbers in digital systems.
- Peripherals.
- Memories and AD/DA converters

Practical program:
1. Introduction to development tools and prototyping board
2. Peripheral control by polling (reading of switches)
3. Peripheral control by interruption.
4. Signal modulation. FSK modulator.
5. Numbers in fixed point. FSK demodulator.
6. Design exercise

4. Academic activities

1.- Block A: 2.4 ECTS (60 hours)

   1) Lectures (45 classroom hours).

   1.1) Theoretical classes: Expository and explanatory sessions of contents. The concepts and fundamentals of microprocessor-based electronic systems will be presented and illustrated with real examples. Student participation will be encouraged through questions and brief discussions.

   1.2) Problem solving classes: Problems and cases will be developed with the participation of the students, coordinated at all times with the theoretical contents. The student is encouraged to pre-work the problems.

   2) Laboratory practicals (15 classroom hours). It will consist of the implementation of applications in a system of DSP development, where the design methodology, the operation of the application and the management of the software tools will be assessed. The student will have a script for each practical, which he/she will have to prepare before its development in the laboratory.

2.- Block B: 3.6 ECTS (90 hours)

   1) Teaching assignments (24 hours). This section includes the elaboration of the previous work required in the preparation of the laboratory practices, as well as the elaboration of the reports of the practices carried out.

   2) Study (60 hours). The continuous work of the student will be encouraged through the homogeneous distribution throughout the semester of the various learning activities. The tutorials allow direct attention to the student, identification of learning problems, guidance in the subject, attention to exercises and assignments.

   3) Assessment tests (6 hours) In addition to the grading function, the evaluation is also a tool of learning with which the student checks the degree of understanding and assimilation achieved.

5. Assessment system

1 Laboratory Practices (20%): They will be graded through observation and analysis of the students' work and the "practice reports". CL grade from 0 to 10 points, will represent 20% of the student's overall grade. To pass the internship in the teaching period it is necessary to complete all the practices and obtain a minimum score of 5 points.

2 Theoretical-practical exam (80%): Composed of theoretical-practical questions and problems, to be carried out at the official call.

3 OVERALL TEST (OFFICIAL CALLS)

   Theoretical-practical exam: grade from 0 to 10 points (80%). The correctness of the answers, developments, designs and numerical results will be evaluated.

   Laboratory exam: grade from 0 to 10 points (20%). Students who have obtained an internship grade of 4 points or more during the term will be exempted from this exam . The exam will consist of the implementation in the system of development of practices, of a system similar to those developed during the course in the laboratory practice sessions. The design methodology, the operation of the circuit and the use of the instrumentation and software tools of the laboratory will be assessed.

The final grade will correspond to the weighted average between the grade of the practical part (20%), the grade of corresponding final exam (80%). However, it will be necessary to obtain a minimum grade of 4 points in each of the separate parts in order to average and pass the subject.