Universidad Zaragoza

Academic Year/course: 2022/23

39628 - Programmable Electronic Instruments

Syllabus Information

Academic Year: 2022/23
Subject: 39628 - Programmable Electronic Instruments
Faculty / School: 175 - Escuela Universitaria Politécnica de La Almunia
Degree: 608 -
ECTS: 6.0
Year: 3
Semester: Second semester
Subject Type: Compulsory
Module:

1. General information

1.1. Aims of the course

The objective of the subject is to train the student in the design and programming of programmable electronic systems with special requirements of consumption, portability, reliability and cost. Furthermore, to acquire skills in the use of software development tools and debugging in assembly language and C.

These approaches and objectives are in line with the following Sustainable Development Goals (SDGs) of the United Nations 2030 Agenda (https://www.un.org/sustainabledevelopment/), in such a way that the acquisition of the course learning outcomes provides training and competence to contribute to their achievement to some degree.

Goal 4: Quality Education

4.3 Ensure equal access for all women and men to affordable and quality technical, vocational and tertiary education, including university.

4.4 Substantially increase the number of youth and adults who have relevant skills, including technical and vocational skills, for employment, decent jobs and entrepreneurship.

Goal 5: Gender Equality

5.1 End all forms of discrimination against all women and girls everywhere.

1.2. Context and importance of this course in the degree

The subject of programmable electronic systems is part of the group of subjects that make up the module called Electricity and Electronics. It is a subject of the third year located in the second semester and it has a mandatory nature, with a 6 ECTS credits teaching load. Creates the basis of knowledge in programmable electronics systems that constitutes core of decision and control of a current mechatronic system.

1.3. Recommendations to take this course

The subject Electronic programmable systems has no mandatory prior requirements, but students of Mechatronics Engineering are advised to at least have completed, the following subjects: Computer Science, Electrical Engineering and Electronic Technology I.

2. Learning goals

2.1. Competences

The student will acquire the following generic and specific competences:

- GC03: Ability for abstraction and logical thinking.
- GC04: Ability for lifelong, independent learning.
- GC06: Ability to adapt to the rapid technology development.
- GC08: Ability to locate technical information, as well as its understanding and evaluation.

- GC10: Ability to write technical documentation and present it with the help of adequate computer tools.
- EI05: Knowledge of the basics of electronics.
- EE03: Knowledge of the basics and applications of digital electronics.
- EE04: Ability to design analog and digital electronic systems.
- EE05: Knowledge of the basics and applications of microprocessors.

2.2. Learning goals

1. Knowledge of the basics of programmable electronic systems.
2. Ability to correctly select and use microprocessors that have a predetermined purpose understanding their operation.
3. Ability to develop and implement microprocessor based architectures.
4. Program microprocessor based circuits for embedded applications.
5. Understand the operation of buses, memories, and input / output interfaces in the context of microprocessor based systems for specific applications.
6. Develop applications that integrate protocols and serial communication interfaces.
7. Manage programming tools and program debugging, as well as C programming languages ??and assembler.

2.3. Importance of learning goals

This course has a clear engineering nature, that is, it offers training with application content and immediate development in the labor and professional market. Through the achievement of the relevant learning outcomes the necessary capacity is obtained for the understanding of the operation of the essential blocks that make up a measurement system of a certain physical variable, which will be absolutely essential for the design and start up of any application, plant, process, etc. included within the scope of Mechatronic Engineering.

3. Assessment (1st and 2nd call)

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

Continuous assessment.

The student must demonstrate that they have achieved the expected learning outcomes by the assessment of the following activities:

- Laboratory Practice Activities: In each of the practice activities the results obtained and the process followed will be evaluated. Once the practice tasks have been completed, a report must be produced. This activity is valued from 0 to 10 points and students must get a minimum score of 4 points in each one to make an average. This activity will be carried out individually.

- Written assessment tests and posed works: The assessment test may include theoretical questions, problems to be solved and theoretical-practical questions. The posed works may replace the examination of part of the course in the continuous assessment method. These activities will be valued from 0 to 10 points and a minimum score of 4 points in each of them to make an average.

Assessment activity	Weighting
Laboratory practice activities	50%
Written assessment tests and posed works	50%

To opt for the Continuous Assessment system, at least 80% of the classroom classes (practical, technical visits, classes, etc.) must be attended

Global assessment test.

Following the regulations of the University of Zaragoza in this regard, in courses that offer continuous assessment, a global evaluation test will be scheduled for those students who decide to opt for this second system.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is focus on the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as:

1. Lectures: The theoretical concepts of the subject are explained and illustrative examples are developed as a support to the theory when necessary, focused on calculation, design and development of a mechatronic system.

2. Laboratory Workshop. These classes are highly recommended for a better understanding of the concepts because those items whose calculation is done in theory classes are shown in working mode.

3. Tutorials related to any concept of the subject. This activity is developed in an on-site mode with a defined schedule or through the messaging and forum of the Moodle virtual classroom.

The approach, methodology and assessment of this guide are intended to be the same for any teaching scenarios. They will be adapted to the social-health situation at any particular time, as well as to the instructions given by the authorities concerned.

4.2. Learning tasks

The course includes the following learning tasks:

Lectures. They will take up 2 hours per week till the 40 hours, necessary to accomplish the objectives of the subject study, are reached.

Laboratory Workshop. It will take up 10 sessions of 2 hours duration. The group is divided up into various groups, according to the laboratory capacity.

Autonomous work and study. This off-site part is equivalent to 90 hours, necessary for the study of theory, problem solving and revision of documents.

Tutorials. Each teacher will announce a Student Tutorial Timetable throughout the four-month period.

4.3. Syllabus

Unit I	Introduction to the design of microprocessor based systems.
Unit II	AVR family Architecture.
Unit III	Programming in C.
Unit IV	Digital input/output.
Unit V	Interrupt system.
Unit VI	Timers and counters.
Unit VII	A/D and D/A Conversion. (digital filters)
Unit VIII	Serial Communications.
Unit IX	Advanced microcontrollers.

4.4. Course planning and calendar

Calendar of classroom sessions and presentation of works

In the continuous assessment mode, the delivery of several partial works and a final course work whose delivery dates will be defined during the course is mandatory:

The final dates will be published in the digital teaching network (Moodle).

The global assessment test will be held at the end of the semester and will consist of a written test on theoretical arguments and problems of all the topics explained in class. The dates of the two final exams will be those officially posted on https://eupla.unizar.es/asuntos-academicos/examenes

The class timetable will be found on the EUPLA website http://www.eupla.unizar.es/

In addition, students will have, at the beginning of the course, the dates and places of the exams necessary to pass this subject.

4.5. Bibliography and recommended resources

http://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=39628

Material	Medium
Syllabus theory notes Additional syllabus information	Paper/repository
Syllabus theory notes Syllabus presentations Useful links	Digital/Moodle E-Mail

technical information	Paper/repository Digital/Moodle
Compiler and simulator software	Computer Lab
Arduino UNO ATMEGA328 ATAVRDRAGON board emulator, programmer for AVR	Laboratory