Microprocessors and Peripherals

Code: 102793
ECTS Credits: 6

2025/2026

Degree	Type	Year
Computer Engineering	OB	3
Computer Engineering	OT	4

Contact

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

There are no prerequisites. It is also recommended for students to have notions of Computer Structure and Computer Architecture.

Objectives and Contextualisation

This course, of the Computer Engineering Mention, is in the third course, the second semester of the degree, within the subject "Design of computer systems oriented to applications".

"Microprocessors and Peripherals" is related to the subjects of Computer Fundamentals, Operating Systems, Computer Structure, and Computer Architecture.

The aim of the course is for students to understand the fundamental components used in the design of systems based on digital processors (microprocessors and peripheral devices) and how they are interconnected, analyzing the different interfaces.

Apply knowledge of computer architecture and system design to select the features of the microcontroller, peripherals and peripheral controllers best suited to the needs of the application.

Select the most suitable platform for the design of a system for a specific application and design and develop the solution based on the selected microcontroller.

Competences

Computer Engineering

- Have the capacity to define, evaluate and select hardware and software platforms for the development and execution of computer systems, services and applications.
- Have the capacity to design and build digital systems, including computers, microprocessor based systems and communication systems.
- Have the capacity to develop specific processors and embedded systems and to develop and optimise the software of said systems.
- Have the right personal attitude.

Learning Outcomes

1. Apply knowledge of computer architecture and system design in order to select the processor or embedded system characteristics that best adapt to the needs of the application.
2. Classify the different types of digital system.
3. Develop curiosity and creativity.
4. Identify the possible digital system based architectures for the design of microprocessor based computing systems.
5. Select the most suitable platform for a specific application and design and develop the solution based on the corresponding microprocessor.

Content

Block 1. Design of computer systems based on microprocessors and microcontrollers.

- General purpose digital processors for the design of systems based on applications: Microcontrollers, DSP
- Design Methods
- Selection criteria

Block 2. Peripheral devices. Storage systems.

- Input Peripherals
- Output Peripherals
- Storage Devices
- Interconnection of the peripheral device. Buses.

Block 3. Performance evaluation.

- Specifying and selecting metrics to evaluate performance, reliability, availability, sustainability, and energy efficiency.
- Impact of performance, reliability, and energy consumption on design and implementation.
- Methods and models to evaluate performance.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			

Exercises classes	12	0.48	1, 2, 5
Laboratory classes and Final test	6	0.24	1, 2, 4, 5
Mandatory laboratory classes	12	0.48	3, 5
Theory classes	22	0.88	1, 2, 4, 5
Tutoring and consults	2	0.08	3
Type: Supervised			
Exercises and practices preparation	6	0.24	1, 3
Exercises, reports, and practical assignements	2	0.08	
Type: Autonomous			
Personal work	70	2.8	1, 2, 4, 5
Preparation of works and reports of laboratory classes	10	0.4	1, 3, 5

The teaching methodology followed in the subject is based on a series of training activities that require the presence of the student in the classroom or laboratory, and a series of individual activities that require personal work on the part of the student.

Training activities

- Theoretical lectures
- Exercise-based classes
- Mandatory laboratory classes: They will be carried out in a specific laboratory of the subject
- Supervised activities: Tutoring and consultations. The virtual campus (ALUA Moodle) will be used to facilitate interaction.
- Autonomous: Preparing exercises and practical assignments. Other independent studies
- There is no differentiated treatment for repeating students.

In this course, the use of Artificial Intelligence (AI) technologies is permitted as an integral part of the development of the work, provided that the final result reflects a significant contribution from the student in terms of analysis and personal reflection. The student must clearly identify which parts were generated using such technology, specify the tools employed, and include a critical reflection on how these influenced the process and the final outcome of the activity. Lack of transparency in the use of AI will be considered academic dishonesty and may result in a penalty in the activity's grade, or more serious sanctions in severe cases.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Exercises resolution	20%	2	0.08	1, 2, 3, 4

Individual tests	50%	6	0.24	1, 2, 4, 5
Mandatory laboratory	30%	0	0	1, 3, 5

a) Process and scheduled evaluation activities

The course includes the following evaluation activities:

- Individual tests (knowledge): evaluated through individual tests. The final test is mandatory. The student is not exempt from content even if partial evaluation activities have been passed.
- Work developed: evaluated based on the oral presentation of the project and the proposed work, submission of reports and exercises completed in class, and questionnaires on the virtual campus.
- Laboratory activity: evaluated throughout practical sessions, including presentation of results, reports, and a demonstration video of the work.

To pass the course via continuous assessment, it is essential to pass each part and meet the following minimum requirements:

- Minimum grade of 4.5 in the knowledge section (individual tests).
- Minimum grade of 5 in laboratory practices, with a minimum attendance of 85% and all reports approved.

It should be noted that laboratory activity is non-recoverable; therefore, failing it with a grade below the indicated minimum means the course cannot be passed.

The final grade is obtained according to the weights shown in the "Evaluation Activities" table, provided all parts are passed. Otherwise, if the overall calculation is equal to or greater than 5 but some part is failed, a final grade of 4.5 will be assigned.

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b) Scheduling of evaluation activities

Dates for continuous evaluation and submission of work will be published on the virtual campus. These may be subject to change due to teaching organization or incidents. Any changes will be communicated via the virtual campus and in class.

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c) Recovery process

Students may take the recovery exam if they have participated in a set of activities that represent at least two-thirds of the total grade for the course. Students with an average grade higher than 3 across all course activities may take the recovery exam.

Mandatory activities not submitted during the course (oral presentation of the project or proposed work) can be presented on the final exam day, with a grade of "pass" (5) or "fail" ($\leq$3).

The "Laboratory Practices" activity is non-recoverable. If a grade below 5 is obtained in this section, the course cannot be passed.

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d) Grade review procedure

For each evaluation activity, a place, date, and time will be set for review, during which students can review their work with the teaching staff. In this context, grade appeals may be made and will be evaluated by the course instructors. If the student does not attend this review, no further revisions will be made for that activity.

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e) Special grades: Not Evaluated and Honors

- A student who has not completed any evaluation activity will receive a "Not Evaluated" grade.
- Honors: Awarding an honors grade is at the discretion of the course instructors. UAB regulations indicate that honors can only be granted to students who achieve a final grade of 9.00 or above. Up to 5% of the enrolled students may receive honors.

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f) Consequences of irregularities committed by students: copying, plagiarism...

Without prejudice to other disciplinary measures, any irregularities committed by students that may affect the grade of an evaluation activity will be graded with a zero. Thus, copying, plagiarism, cheating, or allowing others to copy in any evaluation activity will result in failing that activity with a zero.

The use of artificial intelligence (AI) technologies is permitted as support in the development of work, provided that the student makes a significant contribution in the analysis and personal reflection. It is necessary to clearly indicate which parts were generated with AI, the tools used, and provide a critical reflection on how they influenced the process and results. Lack of transparency in this use will be considered academic dishonesty and may result in grade penalties or other disciplinary measures.

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g) Evaluation of repeating students

As a general rule, no distinction is made between repeating and non-repeating students in terms of evaluation. All must follow the same system and requirements.

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h) Single evaluation

This course does not contemplate a single evaluation system.

Bibliography

Marilyn Wolf (2012) Computers as Components: Principles of Embedded Computing System Design. 3rd Edition. Morgan Kaufmann.

Sarah Harris, David Harris. (2015) Digital Design and ComputerArchitecture, ARM Edition. Morgan Kaufmann. Elsevier Science & Technology.

Sarah Harris, David Harris. (2021)Digital Design and ComputerArchitecture, RISC-V Edition . Morgan Kaufmann. Elsevier Science & Technology.

Antonio Díaz Estrella. TEORIA Y DISEÑO CON MICROCONTROLADORES DE FREESCALE. (2008) MCGRAW-HILL. ISBN 9788448170882

Muhammad Ali Mazidi; Shujen Chen; Sarmad Naimi; Sepehr Naimi. Freescale ARM Cortex-M Embedded. Programming Using C Language. (2014) Kindle Edition. Published October 31st 2014 by Mazidi & Naimi

Elecia White. (2011). Making Embedded Systems: Design Patterns for Great Software. O'Reilly Media, Inc.

Christopher Kormanyos. (2015). Real-Time C++: Efficient Object-Oriented and Template Microcontroller Programming. Springer

Joseph Yiu. (2011). The Definitive Guide to the ARM Cortex-M0 Elsevier. / Yiu, Joseph, Llibre en línia.

Software

Code Warrior (FRDM-KL25Z)

C Compiler (gcc)

Assembler (ARM)

Visual Studio Code

MCUXpresso IDE (FRDM MCXA153)

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.

Name	Group	Language	Semester	Turn
(PLAB) Practical laboratories	431	Catalan/Spanish	second semester	morning-mixed
(PLAB) Practical laboratories	432	Catalan/Spanish	second semester	morning-mixed
(TE) Theory	430	Spanish	second semester	morning-mixed