Computer Organization

Code: 102774
ECTS Credits: 6

2024/2025

Degree	Type	Year
2502441 Computer Engineering	OB	2

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Teaching groups languages

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

Prerequisites

Although there are no formally established prerequisites, a good knowledge of the basic functioning of a computer and a certain knowledge of its functional units is indispensable. (Fundamentals of computers and Fundamentals of Computing).

Objectives and Contextualisation

The objective of this subject is to know the operation of a computer, from the point of view of the instruction set, and to learn the operation of the subsystems of Input/Output and memory.
The theoretical concepts on the instruction are are reinforced with the lab sessions where the students learn to program in assembly language.
All the components described in this subject must allow the student to understand the operation of a conventional computer and to a certain extent be able to make a simple design.

Competences

- Capacity to design, develop, evaluate and ensure the accessibility, ergonomics, usability and security of computer systems, services and applications, as well as of the information that they manage.

- Capacity to design, develop, select and evaluate computer applications and systems, ensuring reliability, security and quality, in accordance with ethical principles, and applicable standards and legislation.
- Conceive and develop centralised or distributed computer systems or architectures by integrating hardware, software and networks.
- Have the capacity to design and evaluate person-computer interfaces that guarantee the accessibility and usability of computer systems, services and applications.
- Have the right personal attitude.
- Know and apply the basic and main techniques of parallel, concurrent, distributed and real time programming.
- Know the characteristics, functionalities and structure of operating systems and design and implement applications based on their services.
- Know, understand and evaluate the structure and architecture of computers, as well as the basic components that they are composed of.

Learning Outcomes

1. Analyse and understand the translation that a computer makes of the original source code to generate the executable binary code.
2. Design and evaluate person-computer hardware interfaces that guarantee the accessibility and usability of computer systems, services and applications.
3. Design man-machine interfaces using user centred designs.
4. Design, develop, select and evaluate computer systems, ensuring their reliability, security and quality.
5. Generate proposals that are innovative and competitive.
6. Identify the accessibility, ergonomics and security requirements of computer systems.
7. Identify the architecture of a conventional computer, analysing in detail the different functional blocks that it is composed of.
8. Know and apply design diagrams in computer systems by integrating computer hardware, software and networks.
9. Know and apply the fundamental principles and basic techniques of parallel and real time programming.
10. Know, administer and maintain computer systems in terms of hardware.
11. Understand the assembly language to debug errors in source code and to detect performance problems.

Content

1. Computer structure

2. The Processor

Instruction set. Instruction types. Addressing modes. Instruction format. Data path. Wired control unit. Microprogrammed control unit.

3. Input/Output and buses

Input/Output module. Programmed Input/Output. Interrupts. Direct Memory Access. Buses

4. The memory system

Organization of the memory system. Static and dynamic memory. Cache. Virtual memory.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Exercises	7	0.28	8, 9, 4, 6, 7
Lab	9	0.36	1, 8, 10, 2, 11, 5
Theoretical lessons	20	0.8	4, 7
Type: Autonomous			
Study	100	4	9, 4, 7

1.- Lectures: The knowledge of the subject will be presented in the form of lectures. In them the basic concepts exposed in the subject syllabus will be shown to the student and clear indications of how to complete and deepen these contents will be provided. The master classes, in spite of being mainly an explanation by the teacher, will be participatory for the student giving him the opportunity to ask those points that he does not finish understanding and they will be constantly asked questions and problems to check the good understanding of the exposed subject .
2.- Seminars: The mission of the seminars is double. On the one hand, the scientific and technical knowledge exposed in the lectures will be worked on to complete their understanding and deepen them. For this, diverse activities will be developed, from the typical resolution of problems to the discussion of practical cases. Learning methodologies and cooperative problem solving will be implemented. On the other hand, the seminars will be the natural forum in which to discuss in common the development of practical work, contributing the knowledge that the student lacks to carry it out, or indicating where he can acquire them. The mission of the seminars is to bridge the gap between the master classes and the practical work, which will promote the capacity for analysis and synthesis, critical reasoning, and which will train the student to solve problems.
3.- Practicum: At the beginning of the course the student will receive a dossier with the practical work that must be developed during the course. This practical work is based on the design and programming of assembler programs that allow to understand the operation of a computer and learn the mechanisms of the Input / Output subsystem. The practices will be developed in groups of three students. The practicum includes 6 sessions in the laboratory, lasting 2 hours, where the implementation and debugging of the programs will take place. Before each session the student will have to carry outawork of preparation of the session and will have to show the professor to be able to begin his work in the laboratory. The student will deliver a portfolio of the practicum in order to finish this one that, for reasons of teaching ability, will only be corrected in the case of students whose grade is doubtful.
This approach of the work is oriented to promote an active learning and to develop the capacity competencies of organization and planning, oral and written communication, teamwork and critical reasoning. The quality of the project carried out, its presentation and its operation will be especially valued.

During theory classes and problem seminars, photos and recordings cannot be made without the consent of the teacher.

The platform for virtual communication used throughout the assignautra will be the Virtual Campus - Moodle of the UAB.

TRANSVERSAL COMPETENCES
The transversal competences will be worked and evaluated in several moments throughout the course. specifically:

T06.03 Generate innovative and competitive proposals in the professional activity: In the laboratory sessions the students will carry out a practical work and analyze the proposed solutions to solve the problems raised.

In case the lectures could not be done in presential way, they will be carried out in "telepresential" way. It means, synchronous sessions of theory, exercises and practices.

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
Control 1 Instruction set	15%	2	0.08	7
Control 2 Memory	22,5%	2	0.08	4
Control 3 Input/Output	12,5%	2	0.08	4
Exercise Seminar 1	5%	1	0.04	4, 7
Exercise Seminar 2	5%	1	0.04	8, 9
Exercise Seminar 3	5%	1	0.04	1, 6
Exercise Seminar 4	5%	1	0.04	3, 4, 11, 6
Lab	30%	3	0.12	1, 8, 10, 2, 3, 11, 5
Lab Validation	Multiplying factor from 0.5 to 1.25	1	0.04	1, 11

Evaluation process and activities:

The aim of the assessment process is to verify that the students have achieved the knowledge and skills defined in the objectives of the subject, as well as the skills.

The evaluation will be carried out based on the degree of involvement in the seminars, the scientific-technical knowledge of the subject achieved by the students and the practical work developed by the students in groups of 3 people.

The following instruments are used to make this assessment:

- The evaluation of the work in the Seminar sessions, which will include the delivery of a work in each session.

- A series of exams carried out throughout the course, at an individual level, to adequately assess the level of knowledge achieved by the students.

- The assessment of the students' work in the laboratory, as well as the documentation provided for their practical work and the corresponding individual validation test.

Final grade = Seminars grade * (0.2) + Controls grade * (0.5) + Practice grade * (0.3)

- Seminars

Seminars Grade = > The 4 best grades obtained in the 5 seminars will be considered. Each seminar considered has a weighting of 0.25 in the final seminar rating.

The seminars will be held in teams of 3 people (always the same teams). In the exceptional case of not being able to attend a seminar due to force majeure, you can consider the possibility of connecting with the team through Teams and participating in the resolution of the seminar so that attendance can be counted.

Seminars cannot be made up or held on days other than those established in the calendar.

- Controls

Controls grade = Instruction Set * (0.3) + Memory * (0.45) + Input/Output * (0.25)

Minimum average grade of controls: 5 points

Minimum mark for each control to be able to make an average: 2 points

The controls will be carried out face-to-face in a single turn from 15:00 to 17:00 for all groups.

Students who do not pass the part of the tests (either for having obtained less than 2 points in a test or for not reaching an average of 5 points in this part) will be able to take a reassessment exam of ALL the subject matter subject in the schedule established by the coordination.

- Practicum

Practicum grade = Laboratory * Validation

Minimum practice grade: 5 points

Minimum laboratory grade to be able to make an average: 5 points

Attendance at the laboratory sessions is mandatory and cannot be recovered. In the exceptional case of not being able to attend a laboratory session due to force majeure, you can consider the possibility of connecting with the team through Teams and participating in the practice session. Failure to attend two practical sessions means a not pass in the laboratory qualification.

The practical work carried out in the laboratory sessions is NOT RE-ASSESSED.

The practice will be structured in three levels: Basic, Intermediate and Advanced:

- The basic level gives the option of a score between 0 and 6 points, if delivered in the first 3 sessions. If it is delivered in the fourth or fifth session you can reach a 5.5 and if it is delivered in the last session a 5.

- The middle level allows one point to be added to the basic level qualification, if it is given in the two sessions following the delivery of the basic level, and half if it is given from the third session after having delivered the basic level.

- The advanced level gives the option to add one point to the score achieved after delivering the intermediate level if it is delivered in the two sessions following the delivery of the intermediate level and half a point from the third session.

You cannot present a level if you have not previously presented the previous level to the teacher, and he/she has given the approval. Only one level can be presented in a session. A team can request tutoring from their practice teacher to present a level between two laboratory sessions. Levels cannot be submitted after the last lab session.

The grade obtained in the laboratory is individual, and will depend on the attendance, participation and work developed during the practice sessions, and on the answers by each member of the team to the questions that the teacher may ask.

There is a written test of individual validation of the practices in the scheduleestablished by the coordination for the partial seconds in January. A rating of 0 points on the validation test will give a factor of 0.5, a rating of 5

points will give a factor of 1, and a rating of 10 will give a factor of 1.25. In other words, there is a scale factor between 0 and 5 (0.5+0.1*mark) and a scale factor between 5 and 10 (1+0.05*(mark-5)).

Scheduling and operation of the evaluation activities:

The dates of the continuous evaluation tasks and delivery of work will be published on the virtual campus and may be subject to possible changes in programming for reasons of adaptation to possible incidents; the virtual campus (CV) will always be informed about these changes since it is understood that the CV is the usual mechanism for communication of information by the professor. Students who wish to communicate with the teacher electronically must do so using their institutional e-mail and directing it to the teacher's institutional e-mail in order to avoid reception problems.

Both regarding the controls and the overall evaluation, no person will be allowed to enter after 5 minutes from the start of the test. Mobile phones cannot be used in assessment tests.

Qualification review process:

For each assessment activity, a review place, date and time will be indicated in which students can review the activity with the teacher. In this context, claims can be made about the grade of the activity, which will be evaluated by the teaching staff responsible for the subject. People who do not attend this review will not be able to review this activity later.

Special cases:

- The student is considered to have attended the subject when he has completed a seminar exercise and attended a control.

- To pass the subject it will be necessary to have obtained a minimum score of 5 in each of the parts (practicum and controls).

- There will be a global assessment of the theory part (controls) at the end of the semester so that they have passed the practicum, but not the controls. As long as the grade of this global reassessment of the controls is greater than 5 points, the final grade will be calculated by averaging the corresponding grade with the practicum grade and the seminars.

- In case of not passing the subject because of not reaching the minimum score in any of the sections, even though when taking the average the final grade was equal to or higher than 5, the grade that will be placed on the file will be 4, 5. If the average does not reach 5, the grade that will appear in the file will be the average grade obtained numerically.

- In order to qualify for the honors registration qualification, it is a necessary condition to have obtained a final grade for the subject of more than 9 points. On the other hand, only a maximum number of honorary registrations equal to 5% of the number of people registered can be assigned.

Evaluation of repeat students:

Repeat students are assessed in the same way as newly enrolled students, without any difference, nor keeping any notes from the previous year.

Consequences of irregularities committed by students:

Without prejudice to other disciplinary measures that are deemed appropriate, and in accordance with current academic regulations, irregularities committed by a student that may lead to a variation of the grade will be graded with a zero (0). For example, plagiarizing, copying, allowing copying, unauthorized AI use (i.e. Copilot, ChatGPT o equivalents) ..., an assessment activity will result in failing that assessment activity with a zero (0). Assessment activities qualified in this way and by this procedure will not be recoverable. If it is necessary to

pass any of these assessment activities to pass the subject, this subject will be suspended directly, with no opportunity to recover it in the same course.

Single Assessment Evaluation:

This subject DOES NOT HAVE SINGLE ASSESSMENT EVALUATION.

Bibliography

- "Organización y Arquitectura de Computadores. Principios de estructura y funcionamiento" William Stallings. Ed. Pearson. Prentice-Hall.
- "Estructura y diseño de computadores" David Patterson/John L. Hennessy. Ed. Reverté.
- "Computer Systems Design and Architecture" Vicent P. Heuring / Harry F. Jordan. Ed. Addison-Wesley
- "Problemas resueltos de estructura de Computadores" Félix García Carballeira, Jesús Carretero Pérez, José Daniel García Sánchez, David Expósito Singh. Editorial Paraninfo

Software

Visual Studio 2022 Community

Language list

Name	Group	Language	Semester	Turn
(PAUL) Classroom practices	411	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	412	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	413	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	451	Catalan/Spanish	first semester	afternoon
(PAUL) Classroom practices	452	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	411	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	412	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	413	Catalan	first semester	afternoon
(PLAB) Practical laboratories	414	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	415	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	416	Catalan	first semester	afternoon
(PLAB) Practical laboratories	417	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	418	Catalan/Spanish	first semester	morning-mixed
(PLAB) Practical laboratories	419	Catalan/Spanish	first semester	morning-mixed

(TE) Theory	41	Catalan	first semester	morning-mixed
(TE) Theory	43	Spanish	first semester	morning-mixed
(TE) Theory	45	Catalan	first semester	afternoon