Computer Organization

Code: 102774
ECTS Credits: 6

Degree	Type	Year	Semester
2502441 Computer Engineering	OB	2	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

Contact

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Use of Languages

Principal working language: catalan (cat)

Some groups entirely in English: No

Some groups entirely in Catalan: Yes

Some groups entirely in Spanish: No

Teachers

Xavier Cano de Castro

Gemma Sanjuan Gomez

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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.

Methodology

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.

Activities

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

Assessment

The dates of continuous evaluation and delivery of works will be published in the virtual campus and may be subject to possible programming changes for reasons of adaptation to possible incidents; always be informed in the virtual campus about these changes since it is understood that the CV is the usual mechanism of communication of information by the teacher. Students wishing to communicate with the teacher electronically should do so using their institutional email and directing it to the teacher's institutional email to avoid reception problems.

Evaluation criteria:

The objective of the evaluation process is to verify that the student has acquired the knowledge and skills defined in the objectives of the subject, as well as the competences.

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

To make this evaluation, the following instruments are available:

- The evaluation of the student's work in the Seminars, which will include the presentation of a work.

- A series of controls carried out throughout the course, at the individual level, to assess adequately the degree of knowledge reached by the student.

- The assessment of the student's work in the laboratory, as well as the documentation submitted by the students of their practical work and the corresponding individual validation test.

Indicators and assessment:

The final grade will be obtained according to the following scale:

- 30% will come from the qualifications obtained in the seminars.

- 40% will come from the qualifications obtained in the controls. It will be necessary to have obtained a minimum score of 3 points in each control to be able to make the average corresponding to this part, and the average score of the controls must be 5 points out of a maximum of 10 to be able to make average with the final grade. Students who do not pass the evaluation of the controls, must do a re-evaluation test. After each control, a date will be set to carry out the review. This date will be announced on the Virtual Campus when the marks are published.

- 30% of the final grade will come from the practicum. This note will summarize the grades obtained by the student in (1) the work done in the laboratory, (2) the documents delivered and (3) the possible proofs of defense of the work in which they have been summoned. Attendance at ALL laboratory sessions is mandatory. In case of not being able to attend a laboratory session, a proof should be presented to the person responsible for the subject, who will determine if the justification is accepted or not. In case of not presenting proof or that this one is not admitted, the practices will be automatically suspended. To make media with the other notes will be necessary to have 5 points out of a maximum of 10, in the practicum. The work in the laboratory will be divided into three phases corresponding to 3 levels (basic, intermediate and advanced). Reaching the level will give a score of the part of the work in the laboratory up to 6 points, the intermediate a grade up to 7 points, and the advanced a score up to 8 points. Each level reached must be presented to the professor of practices taking into account that in the same laboratory session only one level can be presented. The internship teacher will make an individual assessment of each student in which they will take into account the attitude of the student to the laboratory sessions, the work carried out by the student to the laboratory sessions, the participation in thelaboratory sessions, the answers to the teacher's questions regarding the practice performed, ... Thus, the laboratory note is individual, and it ispossible that students from the same group have different grades. In the event that a student, who has participated in all the laboratory sessions and having presented thepractice, does not pass the evaluation of the laboratory, he / she may be summoned by the professor of practices in the realization of a laboratory revaluing test.

There will be an individual written test that will validate the lab work qualifications. This test will provide a factr between 0,75 and 1,25 that will multiply the lab mark to obtain the practicum mark.

- It is considered that a student has submitted to the subject when he has made a seminar delivery and has 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 an overall evaluation of the theory part (controls) at the end of the semester for those students who have passed the practicum, but not the controls. Whenever the grade of this global evaluation is greater than 5 points, the final grade will be calculated by making the corresponding average with the practicum grade.

- In case of not passing the subject for not reaching the minimum score in any of the sections, although when averaging the final grade is equal to or higher than 5 the note that will be placed in the file will be 4, 5. If the average does not reach 5 the note that will appear in the file will be the average grade obtained numerically.

Both in regard to the controls and the overall evaluation, no students will be allowed to enter after 5 minutes from the start of the test. Mobile phones can not be used in the evaluation tests.

All mid-course controls will be carried out during the afternoon shift schedule (if the pandemic situation allows it).

The repeating students are evaluated in the same way as the newly enrolled students, without any difference, nor keeping any notes of the previous course.

To qualify for the honor qualification, it is a necessary condition to have obtained a final grade of the subject of more than 9 points. On the other hand, only a maximumnumber of license plates equal to 5% of the number of enrolled alumens can be assigned.

For each evaluation activity, a place, date and time of revision in which the student can review the activity with the teacher will be indicated. In this context, claims may be made on the activity grade, which will be evaluated by the faculty responsible for the subject. If the student does not appear in this review, this activity will not be reviewed later.

Without prejudice to other disciplinary measures deemed appropriate, and in accordance with the current academic regulations, irregularities committed by a student that could lead to a variation of the grade will be scored with a zero (0). For example, plagiarizing, copying, letting copy, ..., an evaluation activity, will imply suspending this evaluation activity with a zero (0). The evaluation activities qualified in this way and by this procedure will not be recoverable. If it is necessary to pass any of these evaluation activities to pass the subject, this subject will be suspended directly, without the opportunity to recover it in the same course.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Control 1 Instruction set	12%	2	0.08	7
Control 2 Memory	16%	2	0.08	4
Control 3 Input/Output	12%	2	0.08	4
Lab	30%	3	0.12	1, 8, 10, 2, 3, 11, 5
Seminars 1 Instruction set	9%	2	0.08	4, 7
Seminars 2 Memory	12%	2	0.08	8, 9
Seminars 3 Input/Output	9%	1	0.04	6

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