Universitat Autònoma de Barcelona

2020/2021

Foundations of Computers

Code: 104384
ECTS Credits: 6

Degree	Type	Year	Semester
2503740 Computational Mathematics and Data Analytics	FB	1	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: No
Some groups entirely in Spanish: No

Teachers

Gemma Sanjuan Gomez

Prerequisites

- There are no prerequisites. It is a subject of 1st semester of 1st year.

Objectives and Contextualisation

The objective of this subject is to give the student a general view of the operation of a current computer, seeing its theoretical foundations and the functional units that integrate it, as well as analyzing the improvements introduced at the architectural level to achieve good performance.

Competences

- Apply basic knowledge on the structure, use and programming of computers, operating systems and computer programs to solve problems in different areas.
- Make effective use of bibliographical resources and electronic resources to obtain information.
- Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
- Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
- Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
- Using criteria of quality, critically evaluate the work carried out.
- Work cooperatively in a multidisciplinary context assuming and respecting the role of the different members of the team.

Learning Outcomes

1. Describe the basic operation of computation systems.
2. Make effective use of bibliographical resources and electronic resources to obtain information.
3. Recognise and identify the methods, systems and technologies pertaining to computing.
4. Students must be capable of applying their knowledge to their work or vocation in a professional way and they should have building arguments and problem resolution skills within their area of study.
5. Students must be capable of communicating information, ideas, problems and solutions to both specialised and non-specialised audiences.
6. Students must have and understand knowledge of an area of study built on the basis of general secondary education, and while it relies on some advanced textbooks it also includes some aspects coming from the forefront of its field of study.
7. Understand the basic concepts in the structure and programming of computers.
8. Understand the basic principles of computer logic.
9. Using criteria of quality, critically evaluate the work carried out.
10. Work cooperatively in a multidisciplinary context, taking on and respecting the role of the distinct members in the team.

Content

1.- Numbering systems.

2.- Boole's Algebra.

3.- Basic structure of a computer: Functional units.

4.- Memory hierarchy: Cache memory.

5.- Segmented processing.

6.- Multi / Many-core processors.

6.- Accelerators.

7.-Overview of a Computer System.

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. The master classes, in spite of being mainly an explanation by the teacher, will try to make them participative for the student by giving them the opportunity to ask questions that they do not understand and they are 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 individually. The practicum includes 6 practice sessions, lasting 2 hours, where the implementation and debugging of the programs will take place. Before each session the student will have to carry out a work of preparation of the session andwill 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 can not 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:

T01.00 - Evaluate critically and with quality criteria the work developed: In the laboratory sessions the students will carry out a practical work and analyze the proposed solutions to solve the problems.
T02.00 - Work cooperatively in a multidisciplinary context, assuming and respecting the role of the different members of the team: During the practices, the students will work as a team.
T04.00 - Use the bibliography and electronic resources effectively to obtain information: On a constant basis throughout the assignment, students should consult materials and manuals.

Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Exercise seminars	10	0.4	9, 8, 7, 1, 6, 5, 4, 3, 2
Lab exercises	12	0.48	9, 8, 7, 5, 4, 3, 10, 2
Theoretical lessons	23	0.92	8, 7, 1, 3, 2
Type: Autonomous			
Study, exercises and preparation of lab exercises	97	3.88	9, 8, 7, 1, 3, 10, 2

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:

- Two exercise sessions before the controls carried out in couples to evaluate the collaborative work.

- Two controls carried out throughout the course, at the individual level, to properly assess 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:exercises sessions.

- 20% will come from the marks obtained in the

- 50% 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 averagewith the final grade. Students who do not pass the evaluation of the controls, must do a re-evaluation test.

- 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. 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 basic level will give a rating of the part of the work in the laboratory up to 6.9 points, the intermediate a grade up to 8.9 points, and the advanced a score up to 10 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 the laboratory sessions, the answers to the teacher's questions regarding the practice performed, ... Thus, the laboratory note is individual, and it is possible 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 the practice, 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 of validation of the practicum.

- It is considered that a student has submitted to the subject when he 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).

- An overall evaluation of the theory part (seminars and controls) at the end of the semester will be provided for those students who have passed the practicum, but not the controls. Whenever the grade ofthis 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 because it does not reach the minimum score in any of the sections, although when making the average the final grade is equal or superior to 5 the note that will be put in the file will be 4, 5. In case that 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.

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 maximum number of license plates equal to 5% of the number of alumensmatriculats can be assigned.

Without prejudice to other disciplinary measures deemed appropriate, and in accordance with the current academic regulations, irregularities committed by a student that may lead to a variation of the grade will be scored with a zero (0). For example, plagiarize, copy, let copy, ..., an evaluation activity, will involve 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
Computer structrure exercises	10	1	0.04	8, 7, 6, 4, 3, 10
Fundamentals exam	20	2	0.08	8, 7, 1, 6, 5, 3
Lab exercises	30	2	0.08	9, 8, 7, 3, 10, 2
Structure Exam	30	2	0.08	8, 7, 1, 5, 4, 3
fundamentals Exercises	10	1	0.04	8, 7, 6, 4, 10

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