UAB
Universitat Autònoma de Barcelona

Foundations of Computers

Code: 104384
ECTS Credits: 6

2025/2026

Degree	Type	Year
Computational Mathematics and Data Analytics	FB	1

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 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.

Learning Outcomes

1. CM06 (Competence) Develop effective algorithmic solutions to computational problems in accordance with the established requirements.
2. CM07 (Competence) Analyse the computational complexity of the algorithmic solutions to develop and implement the one that guarantees the best performance.
3. CM08 (Competence) Ensure the correct functioning of an algorithmic solution in accordance with the requirements of the problem to be solved.
4. KM06 (Knowledge) Recognise the basic concepts of computer logic, structure and programming.
5. KM07 (Knowledge) Describe the basic functioning of computer systems.
6. KM08 (Knowledge) Recognise the methods, systems and technologies specific to computation.

7. SM07 (Skill) Use operating systems and software commonly used in various fields.
8. SM08 (Skill) Use algorithmic and data representation structures suitable for problem-solving.

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.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Exercises	6	0.24	
Lab exercises	12.5	0.5	
Theoretical lessons	20	0.8	
Type: Autonomous			
Study, exercises and preparation of lab exercises	101	4.04	

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.

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
Exam 1	35%	2	0.08	KM06, KM07, KM08, SM07, SM08
Exam 2	15%	2	0.08	CM06, CM07, CM08
Lab exercises	30%	1	0.04	CM06, CM07, CM08, KM06, SM07, SM08
Pràctice Quiz 1	Multiplying factor of the lab mark between 0 and 1.25	0.25	0.01	CM06, SM07
Pràctice Quiz 2	Multiplying factor of the lab mark between 0 and 1.25	0.25	0.01	CM06, SM07, SM08
Practicum validation	Multiplying factor of the lab mark between 0 and 1.25	1	0.04	CM06, KM06, SM07
Seminar exercises 1	5%	1	0.04	KM06

Seminar exercises 2	5%	1	0.04	KM06, KM07
Seminar exercises 3	5%	1	0.04	KM06, KM07
Seminar exercises 4	5%	1	0.04	SM08

Evaluation process and activities:

The objective of the evaluation process is to verify that students have achieved 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 achieved by the students and the practical work developed by the students in groups of 3 people in the laboratory sessions.

The following instruments are available to carry out 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 controls carried out throughout the course, individually, to adequately assess the degree of knowledge achieved by the students.

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

Final grade = Midterm grade * (0.5) + Seminar grade * (0.2) + Practical grade * (0.3)

Grade Partials = Partial 1 * (0.7) + Partial 2 * (0.3)

Minimum average grade of Midterms: 5 points

Minimum grade of each partial to be able to make average: 3 points

Students who do not pass the part of the midterms (either because they have obtained less than 3 points in a midterm or because they do not reach an average of 5 points in this part) will be able to take a repeat exam of ALL the subject matter in the schedule established by the coordination.

Seminar grade = > Each seminar has a weighting of 0.25 in the final seminar grade. The seminars will be held in teams of 2 people (always the same teams). In the exceptional case of not being able to attend a seminar due to force majeure, the possibility of connecting with the team via Teams and participating in the resolution of the seminar may be contemplated so that attendance can be counted.

Seminars cannot be rescheduled or rescheduled.

Practical grade = Laboratory * Factor(Questionnaires + Validation)

Minimum grade of internships: 5 points

Minimum laboratory grade to be able to 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, the possibility of connecting with the team by Teams and participating in the practice session may be contemplated so that attendance can be counted. Failure to attend two practice sessions will result in a failure in the laboratory grade.

The practical work carried out in the laboratory sessions DOES NOT HAVE REEVALUATION.

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 it is delivered in the first 3 sessions. If it is delivered in the fourth or fifth session, a 5.5 can be reached and if it is delivered in the last session, a 5.

- The medium level allows one point to be added to the grade of the basic level, if it is delivered in the two sessions following the delivery of the basic level, and half if it is delivered 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 submitting the average level if it is delivered in the two sessions following the delivery of the medium level and half a point from the third session.

A level cannot be presented if the previous level has not been previously presented to the teacher and has given you the go-ahead. Only one level can be presented in one session. In order to pass the practices, it is a necessary condition to achieve a minimum score of 5 points in the laboratory sessions.

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

There are two questionnaires and a written test for individual validation of the internship. The questionnaires will be answered at the indicated times of the practice sessions and the validation test will be carried out on the same day of the second midterm. Each questionnaire will be worth one point and the validation test will be worth 8 points, adding a total of 10 points.

This grade (with a maximum of 10 points) will become a multiplicative factor of the lab grade between 0 and 1.25.A total grade of 0 points in these tests will give a factor of 0, a grade of 5 points will give a factor of 1, and a grade of 10 will give a factor of 1.25. That is, there is a scale factor between 0 and 5 (0.2*grade) and a scale factor between 5 and 10 (1+0.05*(grade-5)).

Programming and operation of the evaluation activities:

The dates of the continuous assessment tests and delivery of assignments will be published on the virtual campus and may be subject to possible programming changes 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 communicating information by the teaching staff. Students who wish to communicate with the teaching staff electronically must do so using their institutional email address and directing it to the institutional email address of the teaching staff in order to avoid reception problems.

Both with regard to the midterms and the re-evaluation, no person will be allowed to enter after 5 minutes from the start of the race. Electronic devices (mobile phones, smart watches, tablets, etc.) cannot be used in the assessment tests.

Procedure for reviewing grades:

For each evaluation activity, once the grades have been published, a deadline will be established to request review. People who have requested a review will be summoned to carry out the review. In this context, complaints may be made about the grade of the activity, which will be evaluated by the teaching staff responsible for the subject. People who do not request a review will not be able to review this activity later.

Special qualifications:

- Students are considered to have taken the subject when they have completed a seminar exercise and have attended a control. In case of not presenting this minimum, the grade awarded will be "Not evaluable".

- To pass the subject, it will be necessary to have obtained a minimum score of 5 in the practical section and average of the controls.

- A global evaluation of the theory part (controls) will be planned 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 repeat assessment of the controls is greater than 5 points, the final grade will be calculated by making the corresponding average with the practicum grade and the seminars.

- In case of not passing the subject because you do not reach the minimum score in any of the sections, even if the final grade is equal to or greater than 5 when the average is made, the grade that will be put in the transcript will be 4.5. In the event that the average does not reach 5, the grade that will appear in the transcript will be the average grade obtained numerically.

- To qualify for the honors grade, it is a necessarycondition to have obtained a final grade of the subject of more than 9 points. On the other hand, a maximum number of honours enrolments equal to 5% of the number of people enrolled can only be assigned.

Evaluation of repeating students:

Repeating students are evaluated in the same way as newly enrolled students, without any difference, nor keeping any grade from the previous year.

Consequences of irregularities committed by students:

Without prejudice to other disciplinary measures that may be deemed appropriate, and in accordance with current academic regulations, irregularities committed by a person that may lead to a variation in the grade will be graded with a zero (0). For example, plagiarism, copying, allowing copying, unauthorized use of AI (e.g., Copilot, ChatGPT or equivalents)..., an evaluation activity will imply suspending that evaluation activity with a zero (0). Assessment activities graded 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, without the opportunity to recover it in the same year.

For this subject, the use of Artificial Intelligence (AI) technologies is allowed exclusively in support tasks, such as bibliographic or information searches, text correction or translations... In the case of laboratory practices, the student will have to clearly identify which parts have been generated with this technology, specify the tools used and include a critical reflection on how they have influenced the process and the final result of the activity. Lack of transparency in the use of AI in this assessable activity will be considered a lack of academic honesty and may result in a partial or total penalty in the grade of the activity, or greater penalties in cases of seriousness. AI tools cannot be used in problem seminars.

Single Assessment:

This subject DOES NOT PROVIDE FOR SINGLE ASSESSMENT.

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

VirtualBox

Ubuntu virtual machine

Geany

Yasm

KDBG

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	1	Catalan	first semester	morning-mixed
(PLAB) Practical laboratories	2	Catalan	first semester	morning-mixed
(TE) Theory	1	Catalan	first semester	morning-mixed