Computer Basics /computer Fundamentals

Code: 102765
ECTS Credits: 6

2025/2026

Degree	Type	Year
Computer Engineering	FB	1

Contact

Name: Vicente Soler Ruíz

Email: vicenc.soler@uab.cat

Teachers

Francisco Serra Graells

Victor Montilla Gispert

Pablo Ulises Herrera Sanchez

Gabriel Ramirez Gonzalez

Juan Escudero Garcia

Isaac Martinez Sabate

Màrius Montón Macian

Jordi Sacristan Riquelme

Teaching groups languages

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

Prerequisites

There are no prerequisites.

Objectives and Contextualisation

This is a basic training course and it is part of the first year of the degree.

The objectives of this course are for students to understand the role of digital systems in the computer world, be capable of designing low-to-medium complexity digital systems using logic gates and reconfigurable devices, and understand that a computer is simply a digital system of a certain complexity.

In the last part of the course, topics corresponding to computer architecture are addressed such as the repertoire of instructions for a basic machine, addressing modes and its programming.

Learning Outcomes

1. KM08 (Knowledge) Recognise the different parts of computers, as well as their internal functioning.
2. SM08 (Skill) Determine the basic architecture and functional units of a computer and its theoretical foundations of programming.

Content

1. Representation of the información in the computer

- Numberical Systems: Most common systems and changes of base
- Text and Number Representation
- Integer Representation (C1, M&S, and C2)
- Fixed-Point and Floating-Point Numbers Representation
- Boolean Algebra and Basic Binary Arithmetic

2. Combinational Circuits (CC)

- Digital signals and digital systems. Description of digital systems. Electronic digital systems (EDS). MOS transistors. AND, OR and INV logical gates. Synthesis of EDS as a process of successive refinements.
- Combinational Circuits. Synthesis from a table I: ROM. Synthesis from a table II: logic gates.
- Boolean algebra. Truth tables.
- NAND, NOR, XOR, NXOR logical gates. 3-state buffers.
- Features: Propagation time. Hardware cost
- Other combinational blocks: multiplexers, decoders, AND-OR planes (PLAs).
- Synthesis tools: Synthesis from algorithms.

3. Sequential Circuits (SC)

- The need for sequential circuits. Some examples. States and synchronization. Synchronous sequential circuits. Clock, reset and set.
- Explicit functional description of SCs. State transition graphs and tables.
- Basic components: Flip flops and latches.
- Synthesis of SC from tables. Moore and Mealy machines. States encoding.
- Registers, counters and memories. Structures, types and most common uses.

4. Introduction to computer architecture

- Basic units of the structure of a computer: CPU (UP, UC), Memory, I/O.
- Machine language: the instruction set and the basic structure of the processor.
- The Basic Computer and introduction to the assembly language.
- Structure of a basic processor: Von Neumann vs. Harvard and CISC vs. RISC architectures.
- Structure and operation of a basic CPU:UC+UP (memory, UAL, Registers).
- Instruction set for a basic machine: instruction types (mem-mem, mem-reg, reg-reg, immediate, etc.).
- Addressing modes: immediate, direct, indirect, indexed, etc.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes

Type: Directed		
Exercise-based classes	30	1.2
Laboratory practices	12	0.48
Type: Supervised		
Case study	12	0.48
Laboratory practice assignments	10	0.4
Type: Autonomous		
Autonomous work	40	1.6
Preparing and solving exercises	16	0.64
Videos viewing	12	0.48

The subject is organized into four main blocks. The materials offered through the Virtual Campus include a series of videos that student body must view before attending class and that contain the theoretical-practical knowledge needed for the design of digital systems and practical exercises.

The subject is taught in "classroom problems" mode. All face-to-face classes are treated as problem-based sessions. The classes are dedicated to solving questions and doubts in the videos, and cases proposed by the teacher. Student body must actively participate in these classes; these are not conventional "theory" classes. They take place in small groups (around 40-50 students), an indispensable condition to reach the necessary degree of interactivity in a subject of eminently practical character.

The course is completed with laboratory practices where the students implement the circuits (they have generraly been limited to be designed "on paper"). Each session accommodates 20-25 students working in groups of 2 and lasts 2 hours.

Tutoring sessions may be individual or in small groups and will be done on demand and in coordination between each teacher and the related students. There may also be open tutoring sessions for all interested students that may be proposed by the teaching staff; but these will require prior submission to the corresponding forum of the Virtual Campus (CV) those specific questions about concepts or exercises that must be addressed in order for the teachers to plan and carry out that tutoring properly.

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
Assessable practice activities	30%	2	0.08	SM08
Submission of exercises	20%	8	0.32	KM08, SM08
Two partial tests and/or final test	50%	8	0.32	KM08, SM08

This course does not include single assessment.

a) Assessment activities

Student assessment includes the following activities:

1. Two individual partial test carried out face-to-face, in a controlled environment, and in written format. These tests assess the student's acquired knowledge and his/her skills solving problems.
2. Exercises resolution: a set of on-line exercises, with automatic grading process, must be delivered on previously scheduled dates. Individual activity.
3. The viewing of videos before attending the class. Individual activity.
4. Activities in which students must demonstrate the skills acquired during the development of the practices. Team activity.

The mark of the course by continued assessment (CA) is obtained from:

1. (activity 1) the mark obtained in the 2 partial test (*PT1 and PT2*),
2. (activities 2 and 3) turn in exercises and video viewing (*Pb*),
3. (activity 4) the mark of the grading activities of practices (*LT)*

following this formula: $CA = PT \cdot 0{,}5 + Pb \cdot 0{,}2 + LT \cdot 0{,}3$

where: *PT* = (*PT1*+*PT2*)/2

To pass the course by continuous assessment (CA) the following conditions must be met:

1. ***CA*** ≥ 5,
2. ***PT1 and PT2*** must be ≥ 4, and ***CA*** must be ≥ 5; and
3. ***LT*** must be ≥ 5

b) Assessment activities: scheduling

Dates of the assessment tests and the submission of exercises are published in the Virtual Campus (VC) and may be subject to changes due to unforeseen eventualities. Any modification will be reported through this platform.

It is important to bear in mind that no assessment activitieswill bepermitted for any student at a different date or time to that established, unlessfor justified causes duly advised before the activity and with the lecturer's previous consent.

c) Retake process

The evaluation activity 1 corresponding to the theory can be retaken in the final test.

1. If the grade obtained in one of the *PP1* or *PP2* tests is **<** 4, this grade must be passed by taking a retake exam for the corresponding test. In order to apply the formula (which takes into account the partial tests, the exercises and the practice activities), the grade obtained in this retake exam must be $\geq$ 5
2. If the grade obtained in both partial test is **<** 4, the student must take a new exam that will include the entire subject. The grade obtained will be the new PP grade, which must be ≥ 5 in order to apply the formula (which takes into account partial tests, exercises and practices).

Activities 2 and 3 (turning in exercises and video viewing) corresponding to 20% of the final grade cannot be retaken. Activity 4 cannnot be retaken either.

If after retaking these new tests *PT* **<** 5 or *LT* **<** 5, the final grade of the course will be the lowest value between *CA* and 4.5.

A student who has passed a partial exam or even passed through continuous assessment can take the retake exam. The final grade will be the one obtained in this retake, whether better or worse than the previous one.

d) Grades review

The review procedure will be informed once the grades have been published and it usually consists of establishing a deadline for students to request the revision and, depending on the requests received, the student will be informed about the specific date and deadline for the review. If the student does not follow the procedure established in the review or does not attend the review, this activity will not be reviewed later.

The review of any test may deal to an improvement and a worsening of the corresponding grade, depending on the revised interpretation of the test.

e)Special grades

- A "non-assessable" grade cannot be assigned to students who have participated in any of the individual partial tests or practices.
- In order to reach the qualification "with Honours", the final grade must be ≥ 9.0. Since the number of students with this distinction cannot exceed 5% of the number of students enrolled in the course, this distinction will be awarded to whoever has the highest final grade.

f) Irregularities committed by the student, copy and plagiarism

Notwithstanding other disciplinary measures deemed appropriate, and in accordance with the current academic regulations, assessment activities will receive a zero grade whenever a student commits academic irregularities that may alter such assessment. Assessment activities graded using this procedure will not be re-assessable. If it is necessary to pass any of these assessment activities to pass the subject, the grading as zero for disciplinary measures will also entail a direct fail for the subject, with no opportunity to re-assess it in the same academic year.

Irregularities contemplated in this procedure include, among others:

- the total or partial copying of a test, practical exercise, report, or any other evaluation activity;
- allowing others to copy;
- presenting group work that has not been done entirely by the members of the group;
- unauthorized use of AI (eg Copilot, ChatGPT or equivalent) to solve exercises, practices and/or any other evaluable activity
- presenting any materials prepared by a third party as one's own work, even if these materials are translations or adaptations, including work that is not original or exclusively from the student;
- having communication devices such as mobile phones, smart watches, etc., accessible during theoretical-practical in-class assessment tests (individual exams).
- talk to peers during individual theoretical-practical assessment tests (exams);
- copy or attempt to copy from other students during theoretical-practical assessment tests (exams); - use or attempt to use writings related to the subject during the performance of the theoretical-practical evaluation tests (exams), when these have not been explicitly allowed.

Restricted use of AI: For this subject, the use of Artificial Intelligence (AI) technologies is permitted exclusively in support tasks, such as bibliographic or information searches. The student must clearly identify which parts have been generated with this technology, specify the tools used and include a critical reflection on how these have influenced the process and the final result of the activity. The lack of transparency in the use of AI in this assessable activity will be considered a lack of academic honesty and may lead to a partial or total penalty in the grade of the activity, or greater sanctions in serious cases.

In future editions of this subject, students who have committed irregularities in a grading activity will not have any of the evaluation activities already carried out set as validated.

In short: copying, allowing copying or plagiarizing (or the attempt to) in any of the grading activities is equivalent to a FAIL, not compensable and with no validations of any of the parts of the subject in subsequent years.

g) Assessment of students who enrolled the subject in previous academic years but did not successfully passed the subject

In the evaluation process described, there will be no differentiated treatment for students who enrolled the subject in previous academic years and did not successfully passed the subject.

Bibliography

- Coursera MOOC: https://www.coursera.org/learn/digital-systems
- The Essentials if Computer Organization and Architecture, Linda Null, Ed. Jones and Bartlett Publishers, ISBN 978-0763737696
- Digital Systems: From Logic Gates to Processors. Deschamps JP, Valderrama E, Terés L. Springer 2017. ISBN 978-3-319-41198-9.
- Complex Digital Systems. Deschamps JP, Valderrama E, and Terés L. Springer 2019. ISBN 978-3-030-12652-0.
- Diseño de Sistemas Digitales. Deschamps JP, Ed. Paraninfo 1989. ISBN 84-283-1695-9.
- Digital Systems Fundamentals. T.L. Floyd. Ed. Prentice Hall. 9ª Edición ISBN: 8483220857.

Software

- Quartus II Web Edition

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
(PAUL) Classroom practices	411	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	412	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	431	Catalan/Spanish	first semester	morning-mixed
(PAUL) Classroom practices	432	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/Spanish	first semester	morning-mixed
(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/Spanish	first semester	morning-mixed

(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	afternoon
(PLAB) Practical laboratories	420	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	421	Catalan/Spanish	first semester	afternoon
(PLAB) Practical laboratories	422	Catalan/Spanish	first semester	afternoon