

**COURSE DATA****DATA SUBJECT****Code:** 34657**Name:** Computer structure**Cycle:** Undergraduate Studies**ECTS Credits:** 6**Academic year:** 2026-27**STUDY (S)**

<b>Degree</b>	<b>Center</b>	<b>Acad. year</b>	<b>Period</b>
1400 - Degree in Computer Engineering	Escola Tècnica Superior d'Enginyeria	2	First quarter
1936 - Double Degree Program in Mathematics-Telematics Engineering	Facultat de Ciències Matemàtiques	3	First quarter

**SUBJECT-MATTER**

<b>Degree</b>	<b>Subject-matter</b>	<b>Character</b>
1400 - Degree in Computer Engineering	Computer engineering	COMPULSORY
1936 - Double Degree Program in Mathematics-Telematics Engineering	Tercer curso	COMPULSORY

**COORDINATION**

MIRALLES TENA IGNACIO

**SUMMARY**

The subject "Computer Structure" is an obligatory subject of the second course of the Bachelor Degree in Computing Engineering. It has assigned a dedication of 6 ECTS that is given in the first four-month period of the second course. This subject is a part of the matter "Engineering of Computers" of the curriculum of the Degree in Computing Engineering and it is of obligatory character.

The subject Computer Structure takes as a principal target that the students know the basic structure of a computer with architecture Von Neumann. In this subject, the vision is completed on the elementary computer that was begun to study in the subject "Fundamental of Computers" of the first year, where there interferes the architecture of the microprocessor and the machine language. Computer Structure is therefore a natural continuation in the study of computer, in introducing the other internal components of computers and the peripheral devices.

The first block of the course focuses on the hierarchical memory system. This will introduce the different memory technologies that are likely to be used to build the computer's memory system. Thus, it is intended



that students know their capabilities in performance, capacity and cost. Then, we introduce the concept of main memory and its internal organization. Subsequently, the student is faced with optimizing the design of the memory under capacity constraints, performance and cost and the solution to this problem based on a hierarchical design. As the first level of the hierarchical system, the structure of the cache and its associated design parameters are shown. The student must know the structure of the cache, its performance and its impact on system performance. Finally, it describes the virtual memory technique that automatically handles the exchange of information between main memory and secondary storage, and completes the hierarchical memory. Upon completion of this subject, students should be able to understand the combined operation of the three levels of memory and evaluate their performance.

In the second part of the course, the student should be able to understand the process of exchanging information between the computer and peripherals. It will present the I/O system structure and the transfer of information. The student should be able to determine the best method to conduct and manage the transfer of data to a particular peripheral device, either based on polling, interrupts or DMA. To complete the study of the internal structure of the computers, the buses that connect all the internal elements and allow the exchange of information between them are shown. This section is intended that students know the structure of the current bus and the data transfers they support.

The last block of the course content focuses on presenting the most common peripheral devices. It begins with the more common data input devices. Then, it moves on to study the mass storage and RAID technologies. This section, it is intended that the student understands the problems associated with the sequential access to the information provided by such devices, how the information is organized within, and the redundancy mechanisms to ensure the accessibility of data. Finally, in order to complete an overview of the computer peripherals, the printer devices and video terminals are shown.

## PREVIOUS KNOWLEDGE

### RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

### OTHER REQUIREMENTS

It is advisable to have studied the subjects corresponding to the subject "Informatics".

## COMPETENCES / LEARNING OUTCOMES

### 1400 - Degree in Computer Engineering

G10 - Knowledge to perform measurements, calculations, assessments, appraisals, surveys, studies, reports, scheduling and other similar work in the field of computer engineering, in accordance with both the knowledge and the specific skills acquired in the degree.

G1 - Ability to design, write, organise, plan, develop and sign projects in the field of computer engineering aimed at the design, development or exploitation of computer systems, services and applications.

G4 - Ability to define, evaluate and select hardware and software platforms for the development and implementation of computer systems, services and applications, in accordance with both the knowledge



and the specific skills acquired in the degree.

G6 - Ability to design and develop computer systems and centralised or distributed computer architectures which integrate hardware, software and networks, in accordance with both the knowledge and the specific skills acquired in the degree.

G8 - Knowledge of basic subject areas and technologies that serve as a basis for learning and developing new methods and technologies, and of those which provide versatility to adapt to new situations.

IC2 - Ability to analyse, evaluate and select the most appropriate hardware and software platforms to support embedded and real-time applications.

R14 - Knowledge and application of the fundamental principles and basic techniques of parallel, concurrent, distributed and real-time programming.

R1 - Ability to design, develop, select and evaluate computer applications and systems while ensuring their reliability, safety and quality, according to ethical principles and current legislation and regulations.

R6 - Knowledge and application of basic algorithmic procedures of computer technology to design solutions to problems, by analysing the suitability and complexity of the algorithms proposed.

R7 - Knowledge, design and efficient use of the types and structures of data most suitable for solving a problem.

R9 - Ability to know, understand and evaluate the structure and architecture of computers, and also the basic components that comprise them.

## DESCRIPTION OF CONTENTS



## 1. Memory Hierarchy

- Main memory
- Memory hierarchy
- Cache memory
- Virtual Memory

## 2. Communications between processor and peripheral devices

- Input/Output system
- Synchronization by polling and interrupts
- Direct Memory Access (DMA)

## 3. Peripheral devices

- Data input devices
- Data Storage Systems
- Video Terminals

## 4. Buses and Interfaces

- Characteristics of a bus
- Types of transfers
- Bus examples

## WORKLOAD

### PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Laboratory	20,00
Classroom practices	10,00
<b>Total hours</b>	<b>60,00</b>

### NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00



Individual or group project	10,00
Independent study and work	5,00
Preparation of lessons	30,00
Preparation for assessment activities	25,00
Resolution of case studies	20,00
<b>Total hours</b>	<b>90,00</b>

## TEACHING METHODOLOGY

### Theoretical activities.

Description: The lectures will develop the issues by providing a global and inclusive vision, analyzing in detail the key issues and more complex, encouraging at all times, participation of students. The workload for students in this section of the total charge of the matter is 19%.

### Practical activities.

Description: Complementing theoretical activities in order to apply the basics and expand the knowledge and experience to be acquired in the course of the work proposed. They include the following types of classroom activities:

- Classes of problems and issues in the classroom
- Regular discussion and resolution of problems and exercises that the students have previously worked
- Labs
- Oral presentations
- Tutoring schedule (individualized or group)
- Conducting individual evaluation questionnaires in the classroom with the presence of teachers.

The workload for students on the total charge of the matter is 21%.

### Personal work.

Description: Realization (outside the classroom) of monographs, literature search directed, issues and problems as well as the preparation of classes and exams (study). This is done individually and tries to promote self-employment. The workload for students on the total charge of the matter is 45%

### Working in small groups.

Description: Realization, by small groups of students (2-4) of work, issues, problems outside the classroom. This work complements the work and encourages individual ability to integrate into working groups.



The workload for students on the total charge of the matter is 15%.

It will use the platform of e-learning (virtual classroom) of the University of Valencia in support of communication with students. Through it you will have access to course materials used in class as well as solve problems and exercises.

## EVALUATION

The subject evaluation will be carried out in the first call preferably through continuous evaluation tests (C) and the evaluation of the practical activities and the laboratory (L). All these activities, controls and laboratory sessions, cannot be make up.

The continuous assessment grade (C) will be calculated as the weighted average of two continuous assessment tests carried out during the course (P\*), at the end of each thematic block or group of subjects: P1 and P2. The following expression will be used, which reflects the relative weight of each thematic block:

$$C = 0.6 \cdot P1 + 0.4 \cdot P2$$

If the continuous evaluation grade is greater than or equal to 5, the student will not have to take the official exam of the 1st call, calculating the grade of the 1st call (N1a) as:

$$N1a = 0,7 \cdot C + 0,3 \cdot L$$

Where the practical activities and the laboratory mark (L) will be calculated as the arithmetic mean of the evaluation of the laboratory sessions.

If C is less than 5, there will be no N1a grade, and the official exam of the 1st call (Ex1) will have to be taken, calculating the grade of the 1st call differently (N1b):

$$N1b = 0,6 \cdot Ex1 + 0,3 \cdot L + 0,1 \cdot C$$

In the case of any student who has passed the continuous assessment and wants to improve his grade N1a, he can take the Ex1 exam, calculating the grade of the 1st call with the two methodologies and staying with the highest, N1a or N1b.

The grade of the 2nd call (N2) will be calculated in a single way, based on the exam grade of the 2nd call Ex2 and with the laboratory (L) and continuous assessment (C) grades obtained during the course. Notes L and C are not recoverable.

$$N2 = 0,6 \cdot Ex2 + 0,3 \cdot L + 0,1 \cdot C$$



Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

In any case, the evaluation of this subject will be done in compliance with the University Regulations in this regard, approved by the Governing Council on 30th May 2017 (ACGUV 108/2017).

## REFERENCES

- Estructura y diseño de computadores: La Interfaz Hardware/Software. Patterson, D.A. y Hennesy, J. Reverté, 4ª Ed., <https://www.vlebooks.com/Vleweb/Product/Index/39387?page=0>
- Computer Organization and Architecture, William Stallings. Pearson, 11th Edition.
- Upgrading and Repairing PCs, 22nd Edition, Scott M. Mueller, 2015