COURSE DATA

Data Subject	
Code	34657
Name	Computer Structure
Cycle	Grade
ECTS Credits	6.0
Academic year	2020 - 2021

Study (s)

Degree	Center	Acad. year	Period
1400 - Degree in Computer Engineering	School of Engineering	2	First term

Subject-matter

Degree	Subject-matter	Character
1400 - Degree in Computer Engineering	6 - Computer engineering	Obligatory

Coordination

Name	Department
PEREZ SOLANO, JUAN JOSE	240 - Computer Science

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 devicess. 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".

OUTCOMES

1400 - Degree in Computer Engineering

- 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.
- 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.
- 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.
- R14 - Knowledge and application of the fundamental principles and basic techniques of parallel, concurrent, distributed and real-time programming.
- IC2 - Ability to analyse, evaluate and select the most appropriate hardware and software platforms to support embedded and real-time applications.

LEARNING OUTCOMES

This course allows for the following learning outcomes:

- Assess the main types of memory technologies and benefits based on your application.

- Understand the effect of memory latency on the execution time.
- Ability to take into account the memory hierarchy to reduce the effective memory latency.
- Assess the role of cache memory and virtual memory system.
- Use properly interrupts and I/O.
- Assess the different types of buses of a computer system.
- Ability to assess the impact of the means of access to data from a secondary storage device and your organization.
- Ability to assess the technology needs for the media.
- Assess the advantages and limitations of RAID architectures.
- Evaluate the performance of a computer in terms of its components (processor, memory, I / S, etc.).

To complement the above results, this subject also permits to acquire the following skills and social abilities:

- Logical reasoning.
- Analysis and synthesis problems.
- Oral and written expression.
- Capacity of personal work.

Ability to work in groups.

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

ACTIVITY	Hours	% To be attended
Theory classes	30,00	100
Laboratory practices	20,00	100
Classroom practices	10,00	100
Development of group work	5,00	0
Development of individual work	5,00	0
Study and independent work	5,00	0
Preparation of evaluation activities	20,00	0
Preparing lectures	15,00	0
Preparation of practical classes and problem	15,00	0
Resolution of case studies	20,00	0
Resolution of online questionnaires	5,00	0
TOTAL	**150,00**	

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 course evaluation will be performed in the first call preferably by the continuous assessment mark (C) and the evaluation of laboratory activities mark (L).

The continuous assessment mark (C) is calculated as the weighted average of 2 continuous assessment tests, done taken during the course, at the end of each group of subjectscourse sections: P1 and P2. The following expression will be used, which reflects the relative weight of each topicpart:

C = 0,6 * P1 + 0,4 * P2

If the continuous assessment mark (C) is greater or equal than 5 the student may not make take the official first call examination of the course, calculating the qualification grade of the first call (N1a)course as:

N1a = 0,8 * C + 0,2 * L

Where the laboratory mark (L) is calculated as the arithmetic meanaverage of the laboratory sessions marks.

The continuous assessment mark (C) and laboratory mark (L) can not be retaken and these marks will be maintained at the first and the second exam sittings.

In the case that C<5 the student must make take the official first call examination (Ex1), calculating the qualification grade of the first call (N1b)course as:

N1b = 0,7 * Ex1 + 0,2 * L + 0,1 * C

If a student, who has passed the first call with continuous assessment with a mark higher or equal to 5 (C> = 5), wants to improve its qualification final grade N1a, they he/she may take the examination Ex1, calculating the 1st call qualificationgrade with both methodologies, N1a and N1b, and keeping the higher one.

At the second exam sittings, thThe qualification grade of the second call (N2) is calculated in only one way, from using the official second examination the second call exammark (Ex2), the laboratory notes marks (L) and continuous assessment mark (C). The final grade of the course in this case is calculated as defined before:

N2 = 0,7 * Ex2 + 0,2 * L + 0,1 * C

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

Basic

- Estructura y diseño de computadores: La Interfaz Hardware/Software. Patterson, D.A. y Hennesy, J. Reverté, 4ª Ed., https://www.dawsonera.com/abstract/9780080886138
- Organización y arquitectura de computadores. William Stallings. 7ª ed. Pearson, http://www.ingebook.com/ib/NPcd/IB_Escritorio_Visualizar?cod_primaria=1000193&libro=1266
- Upgrading and Repairing PCs, 22nd Edition, Scott M. Mueller, 2015

ADDENDUM COVID-19

This addendum will only be activated if the health situation requires so and with the prior agreement of the Governing Council

The teaching method for this subject will follow the teaching model approved by the Academic Committee of the GII / GIM degrees (https://go.uv.es/catinfmult/ModeloDocenciaGIIGIM). If facilities are closed because of COVID-19, lectures will be replaced by synchronous sessions that will run according to the degree timetable, using the tools provided by the university.

The weights for each activity will remain the same as specified in the teaching guide.