ACADEMIC PROGRAM

COMPUTER ARCHITECTURE

B.F.A. IN **COMPUTER SCIENCE**

MODALITY: ON CAMPUS

ACADEMIC YEAR: 2022-2023

Name of the course:	Computer Architecture
Degree :	Computer Science
Location:	Centro Universitario de Tecnología y Arte Digital
Area:	Fundamentals of Computer Science
Year:	1º
Teaching period:	2
Type:	B
ECTS credits:	6
Teaching modality:	On campus
Language:	English
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SUBJECT DESCRIPTION

Area description

This course belongs to the subject “Fundamentals of Computer Science”, where thestudent acquires basic knowledge of the principles that underpin software engineering

Subject description

The objective of this subject is to provide students with a basic vision of the fundamental principles of operation of a computer machine, starting at the level of electronics (both sequential and combinational) and evolving towards the detailed description of the Von Neumann Architecture and its programming using machine language and assembly language.

COMPETENCIES AND LEARNING OUTCOMES

Competencies

BASIC AND GENERAL SKILLS

BC1: Students should demonstrate knowledge in an area of study that builds upon the foundation of general secondary education and goest beyond at a level that, while supported by advanced textbooks, also encompasses certain aspects derived from the cutting edge of their field of study.

BC2: Students should be able to apply their knowledge to their work or vocation in a professional manner, and they should possess the competencies typically demonstrated through the development and defence of arguments as well as problem-solving within their field of study.

BC3: Students must possess the ability to gather and interpret relevant data (usually within their field of study) in order to make judgments that involve reflection on socially, scientifically, or ethically significant issues.

BC4: Students should be capable of conveying information, ideas, problems, and solutions to both specialized and non-specialized audiences.

BC5: Students should have developed the learning skills necessary to pursue further studies with a high degree of autonomy.

CG1 - Ability to understand, plan and solve problems through the development of computing solutions.

GC3 - Knowledge of the scientific fundamentals applicable to the resolution of computing problems.

GC5 - Management of human and technological resources for the correct realization of computer science projects

GC9 - Ability to learn, modify and produce new computer technologies.

SPECIFIC COMPETENCES

CE3 - Knowledge of the relational algebra and the performance of queries in procedural languages for the design of standardized database schemas based on

database schemas based on entity-relational models.

CE9 - Knowledge of control structures, variables, programming syntax and memory usage management in an effective way in the development of a computer application.

in the development of a software application

CE11 - Knowledge of the architecture of the Operating Systems as well as the different mechanisms for the management of processes,

communication and synchronization of processes

CE13 - Knowledge of the fundamentals of computer networks, the different topologies and their communication protocols.

communication protocols

CE16 - Knowledge of the operation of computer systems.

Learning outcomes

Upon completion of the degree, the graduate will be able to:

- To understand the life cycle of an application using different programming languages

- To know how to debug a software application.

- To know and use markup languages (HTML)
- To build web pages using style sheets (CSS)
- To use the control version tool Git in collaborative development
- To know the fundamentals of Boolean Algebra
- To be able to handle logic gates and simple sequential circuits
- To handle the binary representation of different data types
- To understand von Neumann¿s model
- To understand the hardware architecture of a computer.
- To be able to coda basic programs in assembly language
- To know common network technologies (WiFi, BlueTooth, Ethernet¿)
- To know network topologies
- To understand computer communication using protocols such as ARP, IP, TCP, etc.
- To be able to set basic routing configurations.
- To be able to develop simple network applications
- To know the basic architecture of an Operating System
- To understand the principles of process scheduling
- To understand how the hierarchy of memory works
- To be able to develop a simple file system
- To be able to develop a toy driver
- To understand processes/threads communications and synchronization mechanisms

CONTENTS

Information coding

The model of von Neumann and functional units

Assembly language programming

Microprogramming

Memory hierarchy

SUBJECT SYLLABUS

Topic 1 Historical Introduction

Introduction to the subject

history of computers,

Von Neumann

Moore's Law

Topic 2. Hardware and components of a computer

Motherboard

RAM/ROM

Storage

Processors

Other elements

Topic 3 Basic principles of digital electronics

Boolean algebra

Logic gates

Introduction to circuits

Karnaugh Maps

Combinational Circuits

Sequential Circuits

Topic 4. Computer arithmetic

Numbering systems

Conversions between bases

Basic arithmetic operations

Numerical representation systems

Arithmetic with integers

Signed multiplication

Division with sign

floating point

Topic 5. Computer foundation

General structure

Example of executing a program at the hardware level

Instructions (concept, cycles and states)

Interruption cycle

Execution simulation

Topic 6. The processor: Assembler

Machine language

Z80 processor

Assembler on the Z80

Developments with Zeus-ish

TRAINING ACTIVITIES AND TEACHING METHODOLOGIES

TRAINING ACTIVITIES

LEARNING ACTIVITIES	Total hours	Hours of presence
Theoretical / Expository classes	32,00	32,00
Practical classes	22,00	22,00
Tutorials	4,00	2,00
Independent study and autonomous work of the student	50,00	0,00
Elaboration of work (group or individual)	36,00	0,00
Evaluation Activities	6,00	6,00
TOTAL	150	62

Teaching methodologies

Expository method or master lesson

Case learning

Learning based on problem solving

Cooperative or collaborative learning

inquiry learning

Flipped classroom methodology

Gamification

Just in time Teaching (JITT) or classroom on time

Expository method or master lesson

Case method

Learning based on problem solving

Cooperative or collaborative learning

inquiry learning

Flipped classroom methodology

Gamification

TEMPORAL DEVELOPMENT

DIDACTIC UNITS / TOPICS TIME PERIOD

Topic 1 Week 1

Topic 2. Week 2

Topic 3. Week 2, 3, 4 and 5

Topic 4. Week 6, 7, 8 and 9

Topic 5. Week 10

Topic 6. Week 11, 12, 13, 14 and 15

EVALUATION SYSTEM

ASSESSMENT SYSTEM	MINIMUM SCORE RESPECT TO THE FINAL ASSESSMENT (%)	MAXIMUM SCORE RESPECT TO THE FINAL ASSESSMENT (%)
Assessment of participation in class, exercises or projects of the course	0	30
Assessment of assignments, projects, reports, memos	30	80
Objective test	10	60

GRADING CRITERIA

ASSESSMENT SYSTEM	ORDINARY EVALUATION	EXTRAORDINARY EVALUATION

Assessment of participation in class, exercises or projects of the course	10	0
Assessment of assignments, projects, reports, memos	40	40
Objective test	50	60

General comments on the evaluations/assessments

ORDINARY EVALUATION

• Throughout the course, three projects are proposed, carried out in pairs, which must be delivered on the indicated date through the virtual platform. Each project has its own rating and weighting. It is necessary to obtain a minimum 4 separately in each of the projects to pass the subject. If so, the average grade of the practices will count as 40% of the final grade. If it is passed, it is kept until the extraordinary call for the course (inclusive). Late deliveries are not accepted. If, due to a justified and validated major cause, late delivery is accepted, your grade will be significantly reduced.

• Also throughout the course there will be a series of sessions in which exercises are carried out in class for which the participation of students will be requested. This participation will be valued at 10% of the grade. Participation consists of going to the blackboard to solve exercises, answering questions asked by the teacher in practical sessions and showing proactivity in the subject.

• A partial exam will be held that can be graded with a grade:

o Greater than or equal to 4: In this case it will be valued with 25% of the grade for the subject, releasing the subject examined.

o Less than 4: It will not be taken into account and the student in the ordinary exam must re-examine this part.

• In the ordinary exam, students will have to take the exam only from the second part of the syllabus if they have obtained a 4 or more in the midterm or from the complete syllabus otherwise.

Therefore, in the ordinary call, the grade for the subject is calculated as:

o Those students who have obtained 4 or more in the partial exam:

 0.4*projects+0.1*participation in class exercises +0.25*partial 1 + 0.25 ordinary exam only for the second part

o Those students who have obtained less than a 4 in the partial exam

 0.4*projects+0.1*participation in class exercises +0.25*ordinary exam part 2 + 0.25 ordinary exam part 1 (having to re-examine this first part)

To pass the subject in the ordinary call, it is essential that the final grade is at least 5.0 (out of 10). It is mandatory that each of the exams (part 1 taken in the midterm or during the ordinary and part 2) have a minimum grade of 4 in order to apply the weighting. If this criterion is not met, the student's ordinary

evaluation grade will be that of the exam with the lowest grade, and he or she must take the extraordinary evaluation with the complete syllabus.

EXTRAORDINARY EVALUATION

In extraordinary calls, 10% of class participation is not valued.

Students who have failed in the ordinary session (exams exclusively or exams and projects) or students who have been granted the single session. There will be an exam on the entire syllabus that will account for 60% of the final grade. If the student did not exceed the minimum grade of 4.0 in projects or did not complete them, she will have the opportunity to present them.

Students with approved exams according to the ordinary call criteria, but with the project part failed. The student will resubmit the failed projects at the teacher's request with a weight of 40% of the grade and the remaining 60% will be their grades from approved exams.

GENERAL RULES

• Any writing that the student presents (problems, exams, comments on the programs, etc.) must be well presented, correctly written (with commas, periods and full stops in their appropriate place) and without spelling mistakes. The grade of the writing may drop up to 20% otherwise, since a university student is required to have maximum quality in their written expression.

• The use of mobile phones in the classroom is not allowed during the continuous evaluation period, unless expressly indicated otherwise by the teacher. Laptops may only be used for activities related to the subject. The teacher may withdraw the right to use the computer from those students who use it for activities that are not related to the subject (checking emails, news or social networks, consulting or preparing activities for other subjects, etc.).

• Active participation will be required from the student, necessary for the development of the classes. This involves showing interest in the topics explained, participating in the debates and questions posed by the teacher, offering to do exercises on the blackboard, and in general showing a proactive attitude.

• The student will be required to behave well at all times during classes. Bad behavior that prevents the normal development of the class may lead to expulsion from the classroom for a period of time to be determined by the teacher.

• Notes from exams and problems and exercises are not saved between successive academic years.

• The ENTIRE subject will be suspended if it is discovered that a student has copied another

LIST OF REFERENCES (BOOKS, PUBLICATIONS, WEBSITES):

Basic Bibliography:

• Stallings, William. (2005) Computer Architecture and Organization. 7th Edition. Prentice-Hall Publishing. Madrid. 813 pp. ISBN: 978-84-89660-82-3.

• Herrerías Rey, Juan E. (2012) The PC. Hardware and components. Anaya Multimedia. 736 pp. ISBN: 978-84-415-3118-5.

• Tang, W. (1982) Spectrum Machine Language for the Absolute Beginner. Melbourne House Publishers

Recommended Bibliography:

• Patterson, David A. and Hennessy, John L. (2011) Computer structure and design. Hardware/software interface. Reverté Editorial. Barcelona. 913pp. ISBN: 978-84-291-2620-4.

• Floyd, Thomas L. (2006) Fundamentals of digital systems. 9th Ed. Madrid: Prentice Hall. 1005p. ISBN 978-84-8322-085-6

REQUIRED MATERIALS, SOFTWARE AND TOOLS

Type of classroom
Theory classroom

Board and projection system

Materials:
Personal computer

The professor will instruct the students to purchase a series of chips/circuits to perform a real practice, instead of a simulator.

Software:
Cuando sea necesario el profesor indicará el software específico gratuito adescargar e instalar