VNIVERSITAT DE VALÈNCIA

Course Guide
34832 Computer technology

COURSE DATA

Data Subject	
Code	34832
Name	Computer technology
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1407 - Degree in Multimedia Engineering	School of Engineering	1	First term

Subject-matter

Degree	Subject-matter	Character
1407 - Degree in Multimedia Engineering	3 - Informática	Basic Training

Coordination

Name	Department
RUIZ GONZALBO, AURELIO	240 - Computer Science

SUMMARY

The subject "Computer Technology" is a compulsory on first course in the Degree of Multimedia Engineering. Set to a commitment of 6 ECTS taught in the first semester of the first course.

This course aims to introduce students to the technological foundations that underpin the design of the components that make computers and develop the skills necessary to perform both the design of these circuits as choosing the most appropriate technologies and solutions in each case.

For this, the course is divided into two main blocks. At first it is intended that the student develops the foundations of circuit theory and learn about the behaviour and construction of electronic and photonic devices focusing on functionality and practicality.

In the second section the student will work the technical design of digital logic circuits, both

combinational and sequential focusing on the implementation of these circuits in the construction of the components of computers using both mathematical descriptions and blocks as hardware description languages

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

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

Other requirements

There are no previous requirements needed.

OUTCOMES

1405 - Grado en Ingenieria Multimedia

- G6 - Know the basic subject areas and technologies that serve as a basis to learn and develop new methods and technologies and those that provide versatility to adapt to new situations.
- B2 - Understand and master the basic concepts of fields and waves and electromagnetism, theory of electrical circuits, electronic circuits, physical principles of semiconductors and logic families, electronic and photonic devices and their application to solve engineering problems.
- B3 - Be able to understand and master the basics of discrete mathematics, logic, algorithmic and computational complexity, and their application to solve engineering problems.
- B5- Know the structure, organisation, operation and interconnection of computer systems, the fundamentals of their programming and their application to solve engineering problems.
- I4 - Be able to identify, understand and evaluate the structure and architecture of computers, as well as the basic components that comprise them.
- MM25 - Be able to define, evaluate and select hardware and software platforms for the development and implementation of multimedia systems, services and applications, according to the knowledge acquired as described in the specific competences.
- MM28 - Be able to solve problems with initiative, decision-making and creativity and to communicate and transmit the knowledge, abilities and skills of a multimedia engineer.

LEARNING OUTCOMES

This course allows for the following learning outcomes:

- Use mathematical expressions to describe the functions of simple combinational and sequential

circuits.
- Design simple digital circuits using the fundamental building blocks (gates, FF, registers, counters, PLA).
- Design simple digital circuits using a language of high-level description.
- Understand and explain how negative integers are stored (in sign-magnitude and 2-complement) and rendering formats of numerical data.
- Convert numerical data from one format to another.
- Work together to make designs and configurations necessary, distributing the workload to deal with complex problems.
- Knowledge of the different materials used in the manufacture of electronic and photonic devices.
- Understand the operation of the components and basic electronic circuits and photonics.
- Analyze and design basic digital electronic circuitry, using different techniques established for it.
- Explain the characteristics of different logic families using the most appropriate in each case.
- Explain the basics of circuit theory to be able to use these notions to the design and analysis of electronic circuits.

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

• Capacity for analysis and synthesis
• Ability to argue from rational and logical criteria.
• Ability to communicate properly and organized.
• Ability to personal work.
• Ability to work in groups.

DESCRIPTION OF CONTENTS

1. Circuit theory

Ohm laws.
Kirchhoff laws.
Capacitive and inductive devices.

2. Electronics and Photonics

Semi-conductor materials. Semi-conductor P and N. The diode.
Bipolar Junction Transistors (BJT). Features and basic configurations.
Switching electronics with BJTs. The inverter.
MOSFET Transistors. CMOS configuration. Switching electronics with CMOS.
Photonic devices; LED diodes, phototransistors, optocoupplers, etc.

3. Information representation

Positional Numeric Systems. Binary, octal and hexadecimal numbers.
Conversion in positional Systems.
Addition and substraction of binary numbers. Negative numbers representation.
Alphanumeric representation.

4. Combinational circuits

Boolean algebra: basic theorems and properties.
Representation of logic functions: expresions, schemes, tables.
Logic functions analysis.
Logic functions synthesis.
Introduction to VHDL for describing combinacional circuits.
PALs and PLAs: programmable logic concept.
MSI combinational circuits.

5. Digital parameters and logic families

Static and dynamic parameters. Logic families TTL and CMOS. Tables of features.

6. Sequential circuits

Synchronous flip-flops: Performance, construction and VHDL description.
Registers and counters: Performance, construction and VHDL description.

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	20,00	0
Study and independent work	5,00	0
Readings supplementary material	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	3,00	0
Resolution of online questionnaires	2,00	0

TOTAL	**150,00**

TEACHING METHODOLOGY

The methodology used in the course is based on the conduct of lectures and problems that will be complemented by the student's independent work. The target ratio for each of these activities is as follows:

• theoretical activity.
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.
Workload for students on the total load of matter: 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
- discussion sessions and problem-solving exercises and previously worked by the students.
- Practices in Labs
- tutorials scheduled (individualized or group).
- Making of individual evaluation questionnaires.

Workload for students on the total charge of the matter: 21%

• Individual student 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- work.
Workload for students on the total charge of the matter: 45%

• Work 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.
Workload for students on the total charge of the matter: 15%

It will be used 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 continuous assessment (C) and the evaluation of laboratory activities (L).

The continuous assessment mark (C) is calculated as the average of 3 continuous assessment tests, done during the course, at the end of each group of subjects: P1, P2 and P3. It will de uses the following expression, which reflects the relative weight of each topic:

$$C = 0.35 * P1 + 0.5 * P2 + 0.15 * P3$$

The continuous assessment mark (C) can be improved until 1 point with extra activities (Aext) done during the course, whenever C is greater than or equal to 5, calculating the final continuous assessment mark (Cfin) as:

$$Cfin = C + Aext$$

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

$$N1a = 0.75 * Cfin + 0.25 * L$$

Where laboratory note (L) is calculated as the arithmetic mean of the laboratory session evaluation (SL) and the laboratory test (ExL):

$$L = 0.5 * SL + 0.5 * ExL$$

In the case that the continuous assessment is less than 5, the student should make the official first call examination (Ex1), calculating the note of the first call (N1b) as:

$$N1b = 0.6 * Ex1 + 0.25 * L + 0.15 * C$$

If a student who has passed the first call with continuous assessment (C> = 5) wants to improve his or her note (N1a), He or She may take the examination Ex1, calculating the note 1st call with N1b formula. This will involve refusing the mark given by the formula N1a.

The mark of the second call (N2) is calculated in only one way, from the second call exam (Ex2), the lab notes (L) and continuous assessment (C) defined before. If the lab notes (L) is less than 5, the student will have the option to repeat the laboratory test (EXL).

N2 = 0.6 * Ex2 + 0.25 * L + 0.15 * 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

- Patterson/Hennessy. Computer organization and design. ARM Edition. Ed. Elsevier. 2017.
- John Wakerly. Diseño digital. Principios y prácticas 3ª Edición. Editorial Prentice-Hall, 2001.
- S. Barrachina, M. Castillo, J.M. Claver, J.C. Fernández. Prácticas de introducción a la arquitectura de computadores con el simulador SPIM, Ed. Pearson, 2013
- W. Stallings. Organización y Estructura de Computadores. Diseño para optimizar prestaciones. Ed. Prentice Hall, 2006.

Additional

- Fernando Pardo y J. Antonio Boluda VHDL Lenguaje para síntesis y modelado de circuitos. Editorial RA-MA, 1999
- S. Brown and Z. Vranesic. Fundamentals of Digital Logic with VHDL Design. 3e. Editorial Mcgraw-Hill Series in Electrical and Computer Engineering), 2005.