

POLI ESCOLA SUPERIOR TECNOLOGIA GESTÃO TÉCNICO GUARDA	SUBJECT DESCRIPTION	MODELO PED.013.03
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Course	Computer Science					
Subject	Digital Systems I					
Academic year	2023-2024	Curricular year	1st	Study period	2nd semester	
Type of subject	Compulsory	Student workload (H)	Total: 168	Contact: 90	ECTS	6
Professor(s)	António Mario Ribeiro Martins					
<input checked="" type="checkbox"/> Area/Group Coordinator <input type="checkbox"/> Head of Department	(select)	Fernando Melo Rodrigues				

PLANNED SUBJECT DESCRIPTION

1. LEARNING OBJECTIVES

Represent and operate with positive integers numbers in different number systems. Converting decimal fractions, representing rational or irrational numbers in binary, octal and hexadecimal.

Represent and operate on real numbers in the form of base complement. Represent and operate on real numbers in codes.

Represent a truth table by binary variable functions and simplification using Boolean algebra. Simplify functions using Karnaugh maps. Introduction to logic families.

Designing combinational networks using Karnaugh maps, multiplexers, and decoders.

Arithmetic circuits, such as adders, comparators and multipliers.

2. PROGRAMME

Converting from decimal to other number systems. Representation error. Fundamental arithmetic operations on different number systems. Representation of real numbers in the form of true and false complements. Binary code: BCD, XC3, Aiken, Gray, and alphanumeric codes. BCD adding algorithm.

Huntington axioms and Boolean algebra. Elementary logic functions. Truth tables. Simplification with Karnaugh maps. Canonical forms. Use of don't care conditions. Applications with only one type of gate.

Introduction to diodes and transistors. TTL gates.

Decoders and multiplexers. Use of these blocks in combinational circuit design. Design with ROM and PAL.

Half adder and full adders. BCD adders. Fast adders. Matrix multipliers. Booth multipliers.

3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

Representing and operating with rational numbers in different bases requires the teaching of base conversion between natural numbers, operations on different bases, base conversion when one is a power of another

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and only at the end the representation of fractional bits operation, focusing on representation error. The representation of numbers in the complement form is taught first in base ten and then in binary. The representation of real numbers in code is taught at the end of this theoretical part of the subject.

To design logical networks, Boolean algebra is taught as well as simplification with Karnaugh maps, as well as alternative ways of using modules of medium complexity like multiplexers and decoders. Design with ROM and PAL. Finally, adders and multipliers are treated.

4. MAIN BIBLIOGRAPHY

Arroz, Guilherme et al., Arquitectura de Computadores, IST Press, 2nd ed 2009.

Sandige, Modern Digital Design, McGraw-Hill 1990

Taub H., Circuitos Digitais e Microprocessadores 1984

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)

a. METHODOLOGIES

- Lecture.
- Interactive lessons.
- Problem solving lessons.
- Lab work

b. EVALUATION Rules

- Three theoretical tests (35%/30%/35%), with a minimum mark of 5 in 20, weighting 60%.
- Three lab work (40%) with presentation and discussion.
- Normal exam weight 60% with a minimum mark of 5 in 20, replacing the tests.
- Recursive exam is worth 100% or the students can use the evaluation rules for those who did lab work.

6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

This course teaches the digital representation of information, numeric or other, by requiring lecture and interactive lessons. Boolean algebra, crucial to understand the digital project, requires the same kind of lessons. Problem solving in the classroom allows students to train and acquire these skills. The laboratory works with classes serves as an experiential validation of the theories taught, giving the student skills in the handling of integrated circuits.

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7. ATTENDANCE

Wednesday at 17 h 30m until 20h30m.

8. CONTACTS AND OFFICE HOURS

amrmartins@ipg.pt. Office hours during classroom timetable and attendance

9. OTHERS

Pupil can't miss more than five tutorial sessions for being accepted in lab work.

DATE

8 de março de 2024

SIGNATURES

Professor(s), Area/Group Coordinator or Head of Department signatures

Assinatura na qualidade de (clicar)

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(signature)

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