

Course Unit	Computer Architecture and Operating Systems			Field of study	Computer Engineering	
Bachelor in	Management Informatics			School	School of Technology and Management	
Academic Year	2022/2023	Year of study	1	Level	1-1	ECTS credits 6.0
Туре	Semestral	Semester	1	Code	9186-709-1104-00-22	
Workload (hours)	162	Contact hours	T - TP	60 PL - T	C - S - solving, project or laboratory; TC	E - OT - O - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s)

José Carlos Rufino Amaro, Carlos Eduardo Castro Correia, Gilberto Sousa Ferraz

Learning outcomes and competences

- At the end of the course unit the learner is expected to be able to:
- understand the operating mechanism of a processor for the execution of programs, and understand the impact of some improvements on the original von Neuman model

- model
 4. identify and characterize the various storage levels, and the different IO techniques, of a computing system
 5. understand the role and place of an operating system in the overall computing system
 6. recognize the variety of operating systems and their different architectures
 7. identify the types of services provided by the operating system and the basic mechanisms of protection and resource management
 8. know how to install desktop-level operating systems in a virtualized environment and Windows Subsystem for Linux

Prerequisites

Before the course unit the learner is expected to be able to: understand the operation and the goal of small programmes written in a high-level language

Course contents

Introduction to computer architecture. Data representation in computing systems. Boolean algebra and digital logic. Basic CPU operation. Storage and Input/Output technologies. Introduction to operating systems. Architecture of the operating system. Protection and management of resources. Virtualization.

Course contents (extended version)

- Introduction to computer architecture

 main components of a computer
 historical evolution

 - the computer level hierarchy
 the von Neumann model
- 2. Data representation in computing systems
- Data representation in Computing positional numbering systems signed integer representation floating-point representation characters representation
 Boolean algebra and digital logic boolean algebra

- logic gates
 digital components
 karnaugh maps
 4. Basic CPU operation
 main CPU components

 - instruction set architecture
 instruction assembly
- instruction assembly
 instruction processing
 addressing formats
 addressing modes
 instruction pipelining
 Storage and I/O technologies
 storage hierarchy
 main memory
 CPU cache
 secondary storage

 - secondary storage
 tertiary and quaternary storage

- I/O subsystems
 Introduction to operating systems
 Operating system concept
 Specialized systems and rnvironments
 Architecture of the operating system
 System services

 - User interfaces System structure
- 8. Protection and management of resources Hardware protection
- Process management Memory management
- 9. Virtualization
 - Basic concepts on virtualization
 - Installation of virtual machines
 Installation of Linux Environments on Windows10/11 Machines using WSL2
- Recommended reading
- "The essentials of computer organization and architecture, 4th Ed. "; Linda Null, Julia Lobur; Jones and Bartlett Publishers; 2014
 "Princípios Básicos de Arquitetura e Organização de Computadores, 2ª Edição"; Linda Null, Julia Lobur; Bookman; 2010
 "Operating System Concepts, 10th Ed. "; Silberschatz, Galvin & Gagne; John Wiley & Sons; 2018
 "Fundamentos de Sistemas Operacionais, 9a Ed. "; Silberschatz, Galvin & Gagne; LTC; 2015

Recommended reading

5. VMware Workstation Pro Documentation (https: //docs. vmware. com/en/VMware-Workstation-Pro/index. html)

Teaching and learning methods

The unit will be primarily taught using lectures that alternate the exposition of theoretical concepts with the resolution of exercises. All documentation (theoretical slides, exercises and solutions, practical assignments) will be provided through e-learning facilities.

Assessment methods

- Alternative 1 (Regular, Student Worker) (Final)

 Intermediate Written Test 28% (Part 1 evaluation of item 1 to 3 of the course content)
 Intermediate Written Test 28% (Part 2 evaluation of item 4 and 5 of the course content)
 Final Written Exam 39% (Part 3 evaluation of item 6 to 9 of the course contents)
 Experimental Work 5% (Presence of classes)

 Alternative 2 (Regular, Student Worker) (Final, Supplementary)

 Final Written Exam 100% (Evaluates all parts (1+2+3). Modular exam (allows improving previous grades of any part).)

 Alternative 3 (Regular, Student Worker) (Special)

 Final Written Exam 100% (Evaluates all parts (1+2+3). Non-modular (does not consider previous grades of any part).)

 Note: (Regular, Student Worker) (Final, Supplementary)

 Experimental Work 5% (up to 1 value in the presence of classes.)

Language of instruction

Portuguese

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E -	lectronic	validation

José Carlos Rufino Amaro	José Luís Padrão Exposto	Paulo Alexandre Vara Alves
15-10-2022	24-10-2022	24-10-2022