

Course Unit	Embedded Systems			Field of study	Computer Engineering	
Bachelor in	Informatics Engineering			School	School of Technology and Management	
Academic Year	2023/2024	Year of study	1	Level	1-1	ECTS credits 6.0
Туре	Semestral	Semester	2	Code	9119-706-1205-00-23	
Workload (hours)	162	Contact hours			S	E - OT - O Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s)

Joao Afonso Braun Neto, José Augusto de Almeida Pinheiro Carvalho, Flavia Georgina da Silva Pires, Gustavo Silva Funchal, Rebeca Baron Kalbermatter

Learning outcomes and competences

- At the end of the course unit the learner is expected to be able to:
 1. Analyse simple microcontroller architectures based on block diagrams and practical implementation schematics.
- Design microcontroller based systems
- Design microcontroller based systems.
 Program systems based on microcontrollers using C programming language.
 Develop microcontroller based applications with both components: software and with its supporting hardware.
 To know how to use communication protocols between microcontrollers and peripherals.

Prerequisites

Before the course unit the learner is expected to be able to: Develop basic projects based on Digital systems

Course contents

Basic architecture of embedded systems; Low and high level languages programming; Microprocessors and microcontrollers; IO system and communication protocols.

Course contents (extended version)

- Architecture of an embedded system
 Typical 8-bit microcontroller
 Registers, memories, instructions
 Programming of a Microcontroller-based System
 Real time concepts
 Microprocessors and microcontrollers

 - Microprocessors and microcontrollers

 - Arduino
 Data acquisition of sensors and actuators for process control
- 3. Interruptions (internal and external) of a microcontroller
- 4. Communication protocols
 UART, SPI, I2C, 1-wire, Bluetooth, RFID e Ethernet

Recommended reading

- 1. John P. Hayes, Digital System Design and Microprocessors, McGraw-Hill. Fredrick J. Hill, Gerard R. Peterson, Digital Logic and Microprocessors, John Wiley and Sons. 1984
- Simon Monk, Programming Arduino: Getting Started with Sketches, Second Edition, McGrow Hill. 2016.
 Elecia White, Making Embedded Systems: Design Patterns for Great Software, O'Reilly. 2011.

Teaching and learning methods

The unit will be taught using a combination of theoretical lectures and self-learning practical classes guided by the teacher. The practical classes will be oriented to practical case studies, to be solved through projects.

Assessment methods

- Mandatory attendance regime. (Regular) (Final, Supplementary, Special)
 Final Written Exam 40% (Final written test without consultation.)
 Practical Work 60% (4 worksheets (10%) + 2 pratical works 20% and 30% and minitests.)
 Optional attendance regime. (Student Worker) (Final, Supplementary, Special)
 Final Written Exam 40% (Final written test without consultation.)
 Practical Work 60% (4 worksheets (10%) + 2 pratical works 20% and 30% and minitests.)

Language of instruction

English, with additional Portuguese support

Electronic validation

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Joao Afonso Braun Neto, José Augusto de Almeida Pinheiro Carvalho	José Luís Sousa de Magalhaes Lima	Luís Manuel Alves	José Carlos Rufino Amaro
16-03-2024	16-03-2024	16-03-2024	24-03-2024