FACULTY OF **ENGINEERING**

DEGREE COURSE: **COMPUTER AND CONTROL ENGINEERING BS**

SUBJECT: COMPUTER ARCHITECTURE AND OPERATING SYSTEMS

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OBJECTIVES

This course will:

1. provide the student with the basic tools for the analysis and synthesis of combinational and sequential logic circuits.
2. Study models and architectures of computer, with a special attention to the modern design technologies.
3. Learn the basic concepts and components of a complete operating system.

CONTENTS

The course will be divided into three main blocks:

1) Digital Circuit Theory
2) Computer Architecture
3) Operating Systems

The main course topics are as follows:

- Introduction and brief review of the fundamentals of Computer Science
- Models and methods for designing combinational circuits
- Models and methods for designing asynchronous sequential circuits
- Models and methods for designing synchronous sequential circuits
- The language of computers: introduction to the Assembly language
- Architecture of a computer: CPU, I/O, BUS, Interrupts
- Hierarchy of memories: Main memory, cache memories and virtual memory
- New trends in the architecture of computers: Pipeline, Multicore, Multiprocessors, GPU
- Introduction to operating systems: organization of the software which handle the life of a computer
- Management of processes: task scheduling on the CPU, communication and synchronization of processes, concurrency
- Memory management: virtual memory, segmentation and paging
- File system: File structure and operations
- Managing peripherals: Hardware and software organization of the I/O
- Performance and safety in modern operating systems

LEARNING OUTCOMES

The student will:

- acquire the skills necessary for the synthesis of simple combinational and sequential circuits, which are the basics of computers.
- be able to understand and also to design a complete, although simplified architecture of a computer.
- be able to manage the main issues related to the kernel of an operating system and to processes and structures that allow for the proper functioning of the computer and its peripherals.

ASSESSMENT

Written exam: multiple choice and open questions

RECOMMENDED TEXTBOOKS

The main concepts of the course will be presented in the teaching support provided by the professor. The teaching material will be mostly self-contained.
Suggested books for more in-depth reading:

- Andrew S. Tanenbaum, Structured Computer Organization (Fifth or Sixth Edition), Pearson Ed.
- Andrew S. Tanenbaum, Modern Operating Systems (3rd or 4th Edition), Pearson Ed.