

# FACULTY OF **ENGINEERING**

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

**SUBJECT:** FUNDAMENTALS OF DIGITAL ELECTRONICS

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## **OBJECTIVES**

The constant evolution of solid state microelectronics allows the implementation of even more powerful microprocessors and digital integrated circuits. Due to the extremely high scale of integration the complexity of digital systems has increased and it is no longer possible to design them without using tools for Electronic Design Automation (EDA). Nevertheless it is necessary to have a good knowledge about the classical logic design methods to properly use these tools and moreover to understand the functioning of digital systems.

Therefore the course aims to provide:

1. a good knowledge of both combinational and sequential logic design,
2. a basic knowledge of CMOS technology and digital integrated circuits, both programmable and not-programmable.
3. a brief introduction to digital system design by using hardware description language, particularly VHDL, and an introduction to testing techniques.

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## **CONTENTS**

- An introduction to electronic systems
- Number systems and codes
- Finite state machine and Logic Gates
- Boolean algebra
- Combinational logic circuits
- Basic sequential logic circuits: Latches and Flip-Flops
- Sequential logic design and optimization
- Registers and Counters
- Microelectronic technology
- Digital integrated circuits
- Design with hardware description language, VHDL
- Testing techniques

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## **LEARNING OUTCOMES**

At the end of the course the students will be able to:

- design digital logic circuits starting from the functional specifications.

- have a basic knowledge of the electrical and the physical implementation of digital integrated circuits.
- Moreover the students, having a survey of digital building blocks and of digital integrated circuits, will be able to determine the most suitable form of implementation for a given application.
- The students will also have a basic knowledge of design by using hardware description language and of the testing techniques for digital electronic system.

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## **ASSESSMENT**

Written exam: multiple choice and open questions

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## **RECOMMENDED TEXTBOOKS**

Full course notes will be provided.

Most of the topics can be also studied in depth in the following texts:

- T. L. Floyd, Digital Fundamentals, Pearson Ed.
- F. Vahid, Digital Design with RTL Design, Verilog and VHDL, John Wiley & Sons
- M. M. Mano, M. D. Ciletti, Digital Design, Pearson Ed.
- M. M. Mano, C. R. Kime, Logic and Computer Design Fundamentals, Pearson Ed.