

## SUBJECT TEACHING GUIDE

G268 - Digital Systems

Degree in Computer Systems Engineering

Academic year 2022-2023

1. IDENTIFYING DATA					
Degree	Degree in Computer Systems Engineering			Type and Year	Core. Year 1
Faculty	Faculty of Sciences				
Discipline	Subject Area: Fundamentals of Computer Science Basic Training Module				
Course unit title and code	G268 - Digital Systems				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web	<a href="https://aulavirtual.unican.es">https://aulavirtual.unican.es</a>				
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERÍA INFORMÁTICA Y ELECTRÓNICA				
Name of lecturer	JOSE ANGEL GREGORIO MONASTERIO				
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Other lecturers	PABLO ABAD FIDALGO PABLO PRIETO TORRALBO				

3.1 LEARNING OUTCOMES
- To know the basic postulates of Boolean Algebra.
- To know how to represent and minimize logic functions using different types of operators.
- Analyze and synthesize a logic circuit, i.e., getting the logical expression from its scheme as well as obtaining the circuit from a set of specifications.
- To know basic concepts of finite-state machines, including time management in digital design.
- To understand the behaviour of flip-flops, both its triggering configuration and its internal architecture.
- To synthesize sequential circuits, i.e., obtain a circuit from its natural language description.
- To know the internal structure and behaviour of different types of counters and shift registers.

#### 4. OBJECTIVES

This subject introduces students to the basic blocks available for building digital systems, focusing on circuits that can be part of a computer. Its main objective is that students know and understand the functional blocks that they will find while studying each unit that makes Von Neumann model.

#### 6. COURSE ORGANIZATION

##### CONTENTS

1	<p>Introduction</p> <ul style="list-style-type: none"> <li>- Computer</li> <li>- Logic Circuits</li> <li>- Information</li> <li>- Coding</li> <li>- Analog and Digital Signals</li> <li>- Languages</li> <li>- Programs</li> </ul>
2	<p>Natural Numbers</p> <ul style="list-style-type: none"> <li>- Numbering system and basic operations</li> <li>- Integers</li> </ul>
3	<p>Combinational logic circuits (CLC)</p> <ul style="list-style-type: none"> <li>- Introduction, definition</li> <li>- Mathematical model</li> <li>- Logic Gates</li> <li>- Large CLCs connecting small ones</li> <li>- CLC Analysis</li> <li>- Boolean Algebra</li> <li>- Analysis and Synthesis using Boolean Algebra</li> <li>- Sum of minterms</li> <li>- Decoder</li> <li>- ROM</li> </ul>
4	<p>Sequential logic</p> <ul style="list-style-type: none"> <li>- Introduction, basic definitions</li> <li>- Memory needs, D flip-flop</li> <li>- Synchronization needs, clock</li> <li>- Mealy model, specification</li> <li>- Moore model, specification</li> <li>- Synthesis of sequential circuits</li> <li>- Analysis of sequential circuits</li> </ul>
5	<p>Basics of a general-purpose processor</p> <ul style="list-style-type: none"> <li>- General Processing Unit</li> <li>- Adding Data Memory</li> <li>- Explicit and Implicit Sequencing</li> <li>- Coding Control Signals</li> <li>- Instruction format</li> <li>- General Control Unit</li> </ul>

### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Core Themes Exams	Written exam	No	Yes	10,00
Exams of lab work	Laboratory evaluation	No	Yes	40,00
Final Exams (February and September)	Written exam	Yes	Yes	50,00
<b>TOTAL</b>				<b>100,00</b>
Observations				
Observations for part-time students				
Students verifying these conditions and that do not take the exams and/or do not pass the practices during the course, need to take a global test.				

### 8. BIBLIOGRAPHY AND TEACHING MATERIALS

#### BASIC

Digital Design and Computer Architecture (ARM ed.), D. Money Harris & S. Harris, ed. Morgan Kaufmann, 2016.