

**1. General information****Course:** DIGITAL ELECTRONICS I**Type:** CORE COURSE**Degree:** 359 - UNDERGRAD. IN INDUSTRIAL ELECTRONICS AND AUTOMAT. ENGINEERING (CR)**Center:** 602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL**Year:** 3**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 56504**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 20**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** JAVIER VAZQUEZ DEL REAL - Group(s): 20

Building/Office	Department	Phone number	Email	Office hours
Politécnico/2-D10	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES	vía Teams	javier.vazquez@uclm.es	

2. Pre-Requisites

Knowledge of the principles of Electric Circuit Analysis.

Knowledge of the foundations of Electronics.

To be familiar with the use of computers and software packages applied to engineering.

3. Justification in the curriculum, relation to other subjects and to the profession

The goal of the degree in Industrial Electronics and Control Engineering is to educate students that will become electronic engineers. Students are trained to perform tasks related to the design, development and maintenance of products manufactured by the electronic industry.

The main objective of Electrónica Digital I is to provide students with core knowledge regarding both theoretical and practical aspects of the analysis and the design of nonprogrammable digital electronic circuits, both combinational and sequential.

By the end of the term students taking this course should be able to:

- Identify and understand up-to-date underlying technologies on which the microfabrication of digital circuits is based.
- Understand how switching devices operate in a digital circuit, especially with CMOS logic.
- Apply a range of methods and techniques intended to simplify logic expressions.
- Solve design problems using the typical building blocks involved in digital logic design, limited to the small and the medium scale integration (SSI and MSI). More sophisticated devices belonging to the large and the very large scale integration (LSI and VLSI) will be studied in the subject Electrónica Digital II.

Ideally, students taking Electrónica Digital I should have previously attended and passed subjects in, at least, electric network theory and fundamentals of analog electronics. The fundamentals of digital logic taught in Electrónica Digital I are an essential starting point to study more advanced topics in this area of expertise, specifically in programmable digital logic and computer architecture, subjects which are also studied in the degree.

4. Degree competences achieved in this course**Course competences**

Code	Description
A02	To know how to apply knowledge to work or vocation in a professional manner and possess the competences that are usually demonstrated by the formulation and defence of arguments and the resolution of problems in the field of study.
A05	To have developed the learning skills necessary to undertake subsequent studies with a greater degree of autonomy.
A07	Knowledge of Information Technology and Communication (ITC).
A08	Appropriate level of oral and written communication.
A12	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
A13	Ability to take the initiative to solve problems, take decisions, creativity, critical reasoning and ability to communicate and transmit knowledge, skills and abilities in Industrial Electronic Engineering and Automation.
A15	Ability to work to specifications and comply with obligatory rules and regulations.
D03	Knowledge of the fundamentals and applications of digital electronics and microprocessors.
D06	Ability to design analogue, digital and power electronic systems.
D07	Knowledge and ability for modelling and simulation of systems.

5. Objectives or Learning Outcomes**Course learning outcomes**

Description

Ability to analyze, design, model and simulate combinational and sequential circuits using basic elements, functional blocks and hardware description language

Additional outcomes

The hardware Description Languages (HDLs) will be covered in Electrónica Digital II, with emphasis on VHDL.

6. Units / Contents**Unit 1: Combinational logic**

Unit 1.1 Overview of digital systems

Unit 1.2 Digital circuits

Unit 1.3 Number systems and codes

Unit 1.4 Minimization of logic functions

Unit 1.5 Modular combinational logic

Unit 2: Sequential logic

Unit 2.1 Introduction to sequential devices

Unit 2.2 Modular sequential logic

Unit 2.3 Synchronous design

Unit 2.4 Asynchronous design

Unit 2.5 Simplification of sequential circuits

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	A12 A15 D03 D06 D07	0.96	24	N		Lectures in the classroom using the ordinary resources (slide projection and blackboard)
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	A12 A13 A15 D03 D06 D07	0.8	20	N		Lectures focused on problem solving using the blackboard
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	A02 A07 A12 A13 A15 D03 D06 D07	0.56	14	Y	Y	Practical case studies focused on the analysis and design of combinational and sequential logic circuits.
Final test [ON-SITE]	Assessment tests	A02 A05 A08 A12 A13 A15 D03 D06 D07	0.08	2	Y	Y	Individual written assessment
Writing of reports or projects [OFF-SITE]	Guided or supervised work	A02 A05 A07 A08 A12 A13 A15 D03 D06 D07	0.4	10	Y	Y	Individual report focused on digital analysis and design of practical case studies.
Practicum and practical activities report writing or preparation [OFF-SITE]	Group Work	A02 A05 A07 A08 A12 A13 A15 D03 D06 D07	0.4	10	Y	Y	The report should include a description of the work carried out during the laboratory sessions.
Study and Exam Preparation [OFF-SITE]	Self-study	A02 A05 A07 A08 A12 A13 A15 D03 D06 D07	2.8	70	N		Personal study
Total:			6	150			
Total credits of in-class work: 2.4			Total class time hours: 60				
Total credits of out of class work: 3.6			Total hours of out of class work: 90				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Final test	60.00%	60.00%	The written exam will consist of a number of questions and problems to be solved.
Practicum and practical activities reports assessment	25.00%	25.00%	Drafting of a lab report describing the work carried out in the laboratory.
Theoretical papers assessment	15.00%	15.00%	Individual report.
Total:	100.00%	100.00%	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:**Continuous assessment:**

Students will score a final mark that will result from the assessment of the three contributions listed in the evaluation criteria and their corresponding weights. The three parts must be passed.

Non-continuous evaluation:

Students will score a final mark that will result from the assessment of the following three contributions:

- Written test (60%)
- Implementation of at least one case study in the laboratory (25%)
- Delivery of an individual report (15%)

Specifications for the resit/retake exam:

The marks corresponding to those parts that were passed in the final exam will be saved for the resit exam.

Specifications for the second resit / retake exam:

Same criteria as for the final exam

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Final test [PRESENCIAL][Assessment tests]	2
Writing of reports or projects [AUTÓNOMA][Guided or supervised work]	10
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	10
Study and Exam Preparation [AUTÓNOMA][Self-study]	70
Unit 1 (de 2): Combinational logic	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	12
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	10
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	8
Unit 2 (de 2): Sequential logic	
Activities	Hours
Class Attendance (theory) [PRESENCIAL][Lectures]	12
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	10
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	6
Global activity	
Activities	hours
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	20
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	14
Final test [PRESENCIAL][Assessment tests]	2
Writing of reports or projects [AUTÓNOMA][Guided or supervised work]	10
Practicum and practical activities report writing or preparation [AUTÓNOMA][Group Work]	10
Study and Exam Preparation [AUTÓNOMA][Self-study]	70
Class Attendance (theory) [PRESENCIAL][Lectures]	24
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
C. Roth	Fundamentos de diseño lógico, 5ª ed.	Thomson			2004	
J. García Zubía	Problemas resueltos de electrónica digital	Thomson			2003	
J. García Zubía, I. Angulo Martínez, J.M. Angulo Usategui	Sistemas digitales y tecnología de computadores, 2ª ed.	Thomson			2007	
J.F. Wakerly	Diseño digital. Principios y prácticas 3ª ed.	Prentice Hall			2001	
J.M. Angulo Usategui, J. García Zubía	Sistemas digitales y tecnología de computadores	Paraninfo			2002	
S. Brown, Z. Vranesic	Fundamentals of digital logic with VHDL design, 3rd ed.	Mc Graw Hill			2009	
V.P. Nelson y otros	Análisis y diseño de circuitos lógicos digitales	Prentice Hall			1996	
J. Vázquez	Circuitos lógicos digitales: del diseño al experimento, 2ª ed.	Marcombo			2020	
E. Mandado, J.L. Martín	Sistemas electrónicos digitales, 10ª ed.	Marcombo			2015	
S. Acha y otros	Electrónica digital. Lógica digital integrada, 2ª ed.	Ra-Ma			2010	
T.L. Floyd	Fundamentos de sistemas digitales, 11ª ed.	Pearson			2016	