



DEGREE CURRICULUM

DIGITAL ELECTRONICS

Coordination: ROIG MATEU, CONCEPCIÓN

Academic year 2017-18

Subject's general information

Subject name	DIGITAL ELECTRONICS			
Code	102120			
Semester	1st Q(SEMESTER) CONTINUED EVALUATION			
Typology	Degree	Course	Typology	Modality
	Bachelor's Degree in Automation and Industrial Electronic Engineering	3	COMPULSORY	Attendance-based
ECTS credits	6			
Groups	1GG,2GM,4GP			
Theoretical credits	3			
Practical credits	3			
Coordination	ROIG MATEU, CONCEPCIÓN			
Department	INFORMATICA I ENGINYERIA INDUSTRIAL			
Important information on data processing	Consult this link for more information.			
Language	Catalan			
Office and hour of attention	Concepció Roig: Friday from 13:00 h to 14:00 h, Josep M. solà: Friday from 13:00 h to 14:00 h.			

Teaching staff	E-mail addresses	Credits taught by teacher	Office and hour of attention
ROIG MATEU, CONCEPCIÓN	roig@diei.udl.cat	3	Desk 3.13. Arrange a meeting by email.
SAIZ VELA, ALBERT	asaiz@diei.udl.cat	1,6	desk 1.05. Arrange a meeting by email.
SOLA GIMENO, JOSEP MARIA	jmsola@diei.udl.cat	5,2	

Learning objectives

Goals

- Learning basic digital devices.
- Establishing operation mechanisms of digital circuits.
- Understanding the applicability of digital circuits in the development of control circuitry and microprocessors.
- Proposing digital circuits able to solve specific problems, meeting constraints related to minimization and availability of devices.
- Analysis of the behaviour of a specific digital circuit and deduction of the implemented logic functions .
- Given a specific situation to be solved with a digital circuit, find out the minimum circuit that responds for this solution.

Competences

Degree-specific competences

- GEEIA21. Knowledge of the basics and applications of digital electronics and microprocessors.
- GEEIA24. Capacity to design analog, digital and power electronic systems.

Degree-transversal competences

- EPS1. Ability to resolve problems and elaborate and defend arguments inside their field of study.
- EPS6. Capacity of analysis and synthesis.

Subject contents

Chapter 1. Logic functions

- 1.1. Switching algebra
- 1.2. Representation of functions.
- 1.3. Incompletely specified functions.
- 1.4. Simplification methods,
- 1.5. Multifunctional simplification.

Chapter 2. Combinational circuits

- 2.1. Pulse and level signals.

- 2.2. Logic gates.
- 2.3. Positive and negative logic.
- 2.4. Two gate level circuits.
- 2.5. Analysis and design of combinational circuits.
- 2.6. Combinational systems.

Multiplexer/ Demultiplexer

Encoder/ Decoder

Comparators

One bit adder/ subtractor

N bits adder

Chapter 3. Sequential circuits

- 3.1. Basic memory cell
- 3.2. Flip-flops
- 3.3. Synchronism
- 3.4. Analysis and design of synchronous sequential circuits
- 3.5. Registers and counters.
- 3.6. Analysis and design of asynchronous sequential circuits

Chapter 4. Memories and programmable logic devices.

- 4.1. ROM Memory
- 4.2. Combinational PLD
- 4.3. Sequential PLD

Methodology

During the week, each student attends 2 hours of classes in Big Group and 2 hours in Medium Group.

- Classes of Big Group. **Master classes.** (3 credits)

They are expositive classes where they are shown the main contents of the subject, supported by exercises and examples.

- Classes of Medium Group. **Problem solving and practices.** (3 credits)

Exercises related to the contents exposed in Master classes are solved in a participative and interactive way. Also, laboratory practices of digital circuits are carried out using the simulator ISIS of Proteus. Besides, practices are carried out in the electronic laboratory.

It is **COMPULSORY** that the students bring the following elements of individual protection (EPI) to the practices at the laboratory.

- Blue laboratory gown from UdL (unisex)
- Protection glasses
- Mechanical protection gloves

They can be purchased through the shop Údels of the UdL:

C/ Jaume II, 67 baixos

Development plan

Week	Description	Activity Big Group	Activity Medium Group
1	Logic functions	Presentation of the subject. Switching algebra. Representation of functions.	Exercises of logic functions
2	Logic functions	Incompletely specified functions. Simplification methods	Exercises of logic functions
3	Combinational circuits	Pulse and level signals. Logic gates. Positive and negative logic. Two level circuits.	Exercises of combinational circuits
4	Combinational circuits	Analysis and design of combinational circuits.	Exercises of combinational circuits
5	Combinational circuits	Multiplexer/Demultiplexer. Encoder/Decoder.	Practice 1
6	Combinational circuits	Comparators. Adder/subtractor of 1 bit	Exercises of combinational circuits
7	Combinational circuits	n bits adders	Practice 2
8	Sequential circuits	Basic memory cell	Exercises of sequential circuits
9	Partial exams	Realization first partial exam	
10	Sequential circuits	Flip-flops and synchronism	Exercises of sequential circuits
11	Sequential circuits	Analysis and design of synchronous sequential circuits	Practice 3
12	Sequential circuits	Registers and counters	Practice 4 (simulated part)
13	Sequential circuits	Analysis and design of asynchronous sequential circuits	Practice 5
14	Memories and programmable logic devices	ROM memory	Practice 4 (part implemented in the electronics lab.)
15	Memories and programmable logic devices.	Combinational and sequential PLD	Practice 4 (part implemented in the electronics lab.)
16	Partial exams	Realization second partial exam	
17	Partial exams	Realization second partial exam	
18	Tutorials		
19	Recuperation exams	Exam recuperation, if necessary.	

Evaluation

N_P1: Mark of first partial exam

N_P2: Mark of second partial exam.

N_Pr: Mark of practices.

The final mark of the subject is calculated as following:

$$\text{FINAL_MARK} = 20\% N_P1 + 50\% N_P2 + 30\% N_Pr$$

To pass the subject it is necessary that FINAL_MARK is greater than or equal to 5.

In the case of not having passed the subject, there is the option to have a recuperation exam. In this case the FINAL_MARK is calculated as following:

N_rec: Mark of the recuperation exam.

$$\text{FINAL_MARK} = 70\% N_rec + 30\% N_Pr$$

Bibliography

- Lloris A., Prieto A., Parrilla L. *Sistemas digitales*. McGraw-Hill.
- Gajski D. D. *Principios de Diseño Digital*. Prentice-Hall.
- García Zubía J. *Problemas resueltos de electrónica digital*. Thomson.
- Marcovitz A. *Introduction to logic design*. McGraw-Hill.