Course guide
220117 - ED - Digital Electronics

Last modified: 19/04/2023

Unit in charge: Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit: 710 - EEL - Department of Electronic Engineering.

Degree: BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2023 **ECTS Credits:** 6.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer: Ortega Redondo, Juan Antonio

Others: Arumi Delgado, Daniel
Simon Garcia, Didac
Paredes Camacho, Alejandro

PRIOR SKILLS

It is recommended to have studied the Electronics course.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE28T-GETI. Knowledge of the fundamentals and applications of digital electronics and microprocessors. (Specific Technology Module - ESEIAAT Itinerary)

Transversal:
2. EFFECTIVE USE OF INFORMATI0N RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.

TEACHING METHODOLOGY

1.- Large group: These classes develop theoretical concepts, some problems, and evaluations for the first and second set level tests. We will use the exhibition model that the teacher sees fit to assimilate the objectives that have been set in the subject.
2.- Small groups: This activity will develop laboratory sessions.
ATHENA platform will be used as a support tool in the two types of classes

LEARNING OBJECTIVES OF THE SUBJECT

1. Understanding and mastering the basics of the digital systems analysis and design.
2. Knowledge of hardware description languages and their application to the design of digital systems.
3. Knowledge of the structure of microprocessors and microcontrollers.
4. Knowledge and domain of embedded systems design (System on Chip) and its application in real systems.

STUDY LOAD

Type	Hours	Percentage
Hours small group	14,0	9.33
Self study	90,0	60.00
Hours large group	46,0	30.67

Total learning time: 150 h

CONTENTS

1.- Introduction to digital systems.

Description:
1.1 Introduction
1.2. Numbering Systems
1.3. Logical gates
1.4. Boolean Algebra
1.5. Logical functions
1.6. Simplification of Logical Functions

Related activities:
Theory classes, problems and laboratory.
Individual test: knowledge about Boolean algebra.
Laboratory: Digital system design. Complete process.

Full-or-part-time: 14h
Theory classes: 6h
Laboratory classes: 2h
Self study : 6h

2.- Programmable Logic Devices.

Description:
2.1. Introduction
2.2. PLDs and FPGAs
2.3. VHDL
2.4. Examples of VHDL descriptions.

Related activities:
Theory classes, problems and laboratory.
Laboratory: Digital system design. The adder.

Full-or-part-time: 17h 30m
Theory classes: 3h 30m
Laboratory classes: 2h
Self study : 12h

3.- Combinational systems.

Description:
3.1. Introduction
3.2. Multiplexers
3.3. Demultiplexers
3.4. Encoders
3.5. Decoders
3.6. Comparators
3.7. Adders

Related activities:
Theory classes, problems and laboratory.
Laboratory: Sequential digital system design: Chronometer .

Full-or-part-time: 21h
Theory classes: 4h
Laboratory classes: 2h
Self study : 15h

4.- Sequential systems

Description:
4.1. Introduction
4.2. Bistable (Flip-Flops)
4.3. Automated
4.4. Registers
4.5. Memories
4.6. Counters
4.7. Sequential System Descriptions on VHDL

Related activities:
Theory classes, problems and laboratory.
Laboratory: Design of complex systems.
First exam, contents: 1, 2, 3 and 4.

Full-or-part-time: 27h 30m
Theory classes: 5h 30m
Laboratory classes: 2h
Self study : 20h

5.- Architecture of microprocessors based systems

Description:
5.1.- Introduction
5.2.- Block diagram of a microprocessor-based system
5.3.- Programming languages
5.4.- Development of applications with commercial microcontrollers

Related activities:
Theory classes, problems and laboratory.

Full-or-part-time: 43h
Theory classes: 20h
Laboratory classes: 4h
Self study : 19h

6.- Input and output transfers. Peripherals

Description:
6.1 Introduction
6.2 Synchronization by pooling
6.3 Synchronization by interrupt
6.4 Timers and counters
6.5 Serial communication interfaces
6.6 A/D Converters

Related activities:
Theory classes, problems and laboratory.

Full-or-part-time: 27h
Theory classes: 7h
Laboratory classes: 2h
Self study : 18h

GRADING SYSTEM

- Partial exam N1P weight: 35%
- Final exam N2P weight: 35%
- Lab NL- weight: 30%

In order to pass the course, it will be necessary to complete all the practicals that are considered compulsory, as well as the presentation of the corresponding reports required by the teaching staff.

The unsatisfactory results of the partial exam may be recovered through a written test to be done on the day set for the final exam. This test can be accessed by students with a mark less than 5.0 of the partial exam. The recover test will be evaluated with a rating between 0 and 5. The mark obtained by applying the recovery will replace the initial qualification as long as it is superior.

BIBLIOGRAPHY

Basic:
- Odant, Bernard. Microcontroladores 8051 y 8052. Madrid: Paraninfo, 1995. ISBN 9788428321884.
- Matas Alcalá, José; Ramos Lara, Rafael. Microcontroladores MCS-51 y MCS-251 [on line]. Barcelona: Edicions UPC, 2001 [Consultation: 02/11/2022]. Available on: http://hdl.handle.net/2099.3/36202. ISBN 9788483014547.

Complementary:
- Stewart, James W.; Miao, Kai X. The 8051 microcontroller: hardware, software and interfacing. 2nd ed. Upper Saddle River, New Jersey [etc.]: Prentice Hall, cop. 1999. ISBN 013531948X.