Digital systems applied to electrical power engineering

Academic Year: (2022 / 2023) **Review date: 20/05/2022 12:19:15**

Department assigned to the subject: Electronic Technology Department

Coordinating teacher: FERNANDEZ HERRERO, CRISTINA

Type: Electives ECTS Credits : 6.0

Year : Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Electronics Engineering Fundamentals
Industrial Electronics

OBJECTIVES

The objective of this course is to provide students with a general knowledge of digital systems applied to system control applications related to electrical engineering. Students will achieve the following skills:
- Knowledge of the basic principles of operation of digital circuits and systems.
- Knowledge of the design methodology and management of basic tools for the development of digital systems.
- Ability to use digital systems in system control applications related to electrical engineering.

DESCRIPTION OF CONTENTS: PROGRAMME

1. INTRODUCTION
   1.1 Course organization
   1.2. Introduction to digital systems applied to Electrical Engineering
      1.2.1. Digital systems in electrical power systems management
      1.2.2 Digital control for power systems, power converters and electrical machines
2. DIGITAL SYSTEMS I
   2.1. COMBINATIONAL SYSTEMS
      2.1.1. Combinational Logic (review). Number systems and information conding
      2.1.2. Combinational circuits
      2.1.3. Design of combinational circuits
      2.1.4. Binary arithmetic
      2.1.5. Arithmetic combinational circuits
   2.2. SYNCHRONOUS SEQUENTIAL CIRCUITS
      2.2.1. Registers and counters
      2.2.2. Introduction to Finite State Machines
3. DIGITAL SYSTEMS II
   3.1 DIGITAL SYSTEMS BASED ON MICROCONTROLLER and MICROPROCESSORS
      3.1.1. Architecture and main elements, memory
      3.1.2 Programming model
      3.1.3 Introduction to C language
   3.2 REFERENCE MICRONCONTROLLER
      3.2.1 Architecture overview
      3.2.2. Development environment
      3.2.3. Peripherals
      3.2.4. Interrupts

LEARNING ACTIVITIES AND METHODOLOGY

- Lectures to introduce the knowledge that students must acquire. Students will receive class slides and will have basic reference texts to reinforce those topics they are most interested in.

- Practical classes to solve exercises and the practical development of the contents presented in the lectures.
- Laboratory sessions, where the student designs, assembles and experiments a digital system.
- There is the possibility of holding a group tutoring session.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

The evaluation of the subject is based on reports containing the solution to exercises based on the activities developed during the classes, and an end of term exam.
The content of the reports is the following:
- Report 1: design, implementation and characterization of a digital system based on an FPGA.
- Report 2: design, implementation and characterization of a digital system based on a microcontroller.

The final grade of the subject will be calculated as follows:
- Option A: 0.4*Report1+0.6* Report2
- Option B: 0.4*Reports+0.6*Exam

BASIC BIBLIOGRAPHY

- Thomas L. Floyd Digital fundamentals, Pearson Prentice Hall.

- null Reference manual and supplementary material provided by the manufacturer for the microcontroller, Manufacturer, 2021

ADDITIONAL BIBLIOGRAPHY

- KUO, BENJAMIN C. "Digital Control Systems ", Oxford University Press, USA; 2 edition (June 1995).

- Brian W. Kernighan, Dennis M. Ritchie The C programming language, Prentice Hall, 1978