ESCUELA TÉCNICA SUPERIOR DE INGENIERÍA

DEA-GITI-222 Electronics

SEMESTER: Spring

CREDITS: 7.5 (5 hrs. per week. 3h Theory + 2h Lab)

LANGUAGE: Spanish

DEGREES: GITI

Course overview

This course is an introduction to the analysis and design of basic electronic circuits and systems, both analog and digital. To do so the following topics are addressed: signal concept, analog and digital electronic systems, frequency domain signal analysis, amplification and operational amplifiers, diodes, signal conditioning systems, digital combinational circuits, and digital sequential systems based on microcontrollers.

Prerequisites

Basic circuits' theory.

Course contents

Theory:

1. Introduction to electronic systems, signals and frequency response. Analog and digital signals, frequency and time domain signal representations, transducers, basic electronic functional blocks and block diagrams, frequency analysis of single time constant networks, with emphasis on low and high pass filters.
2. Amplifiers and operational amplifiers. Amplifiers characteristics (gain, input and output resistances and performance) and amplifiers types (voltage, current, etc.). Operational amplifiers: linear and non-linear applications. Design of simple signal conditioning systems.
3. Diodes circuits. Diodes, circuits with diodes, rectifiers and Zener regulators.
4. Boolean algebra and combinational digital systems. Boolean algebra, number systems, logic gates, truth tables and Karnaugh simplification of Boolean functions.
5. Introduction to microcontrollers. Structure and functionality, programming principles, implementation of Boolean functions with microcontrollers, basic input and output devices, state machines and its implementation using microcontrollers.

Laboratory:

Each unit described previously has at least one associated lab practice (3 hours/week)

- **P1.** Lab introduction: oscilloscope, analog and digital basic components and circuits (including a first approach to Arduino µP).
- **P2.** Basic first order network filtering
- **P3.** Operational amplifiers
- **P4.** Comparators
- **P5.** Peak detectors
- **P6.** Final design

Textbook

- Sedra-Smith, Microelectronic Circuits, 6th ed., Oxford U. P., 2010.
- José Daniel Muñoz Frías, Introducción a los sistemas digitales.

Grading

- Exams during the course account for 20% of the theory grade, mid-term exam for 20%, and final exam for 60%.
- Theory accounts for 65% of the final grade while lab accounts for the other 35%, but both theory and lab must be passed independently before being averaged.