



Electrónica Digital (20408)
Digital Electronics (Part 2 of Industrial Electronics- First Semester)
Total 8.5 ECTS the two semesters (4 ECTS Digital Electronics)

Lecturer: José Manuel Gilpérez Aguilar

Prerequisite: None

Objective

The subject is divided in two parts, analogical and digital circuits, with two different and independent contents that allow us to treat them separately. Here we develop the program of the second part of the course related with Digital Electronics.

The aims of this second part of the course are to present the principles of combinational and sequential digital logic, to know the behavior and function of the basic digital components and understand the main concepts related with the design and analysis of the digital systems.

At the end of the course students should

- Understand the relationships between combination logic and Boolean algebra, and between sequential logic and finite state machines.
 - Be able to design and minimize combinational logic.
 - Understand how state can be stored in a digital logic circuit.
 - Understand the difference between asynchronous and synchronous logic.
 - Know how to design a simple finite state machine from a specification and be able to implement this in gates and edge triggered flip-flops.

Contents

1. An introduction to the digital systems. Digital vs. analogical systems. Combinational vs. sequential systems.

2. Binary numbers and logic functions. Binary representation of numbers. ASCII codes for characters. Truth tables and Boolean algebra. Switch logic. Normal forms. Boolean cubes and Karnaugh maps for boolean optimization.

3. Combinational systems. Logic gates. Decoders and coders. Multiplexers. Shifters. Code converters. Adders. Arithmetic logic units. Programmable logic arrays.

4. Sequential systems. Memory elements, state and state diagrams. RS asynchronous flip-flop. Synchronous flip-flops: D, T and JK flip-flops. Shift registers and counters.

5. Design of sequential systems. Moore and Mealy finite state machines. State transition diagrams.

Teaching disposition

Principal methods of instruction are lectures and laboratory sessions. The subject is exposed by means of a large number of examples that are discussed in class and analysed in the lab by computer simulation.

In case where there are applicants from the ERASMUS exchange programs, the course language will be English. Otherwise, parts of the course may be taught in English.

Examination

The evaluation will be done by two written exams corresponding to the combinational and sequential parts of the subject. There will be a final written exam for those who do not pass any of the previous exams. Attendance in laboratory is mandatory to pass the course.

Students who do not pass the written examination will be offered a re-examination opportunity in September.

Readings and other material

Thomas L. Floyd: *Digital Fundamentals*. 10th Ed. Prentice Hall.

R. Tocci: *Digital Systems: Principles and Applications*. 10th Ed. Prentice Hall.