II Year II Semester 17EC406

DIGITAL ELECTRONICS

Learning Objectives:

- To acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits.
- To prepare students to perform the analysis and design of various digital electronic circuits.
- Work in a design team that can propose, design, successfully implement and report on a digital systems project.

Unit – I

Review of Number Systems & Codes:

- i. Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members, problem solving.
- ii. 4 bit codes, BCD, Excess-3, 2421, 84-2-1 9's compliment code etc.,
- iii. Logic operations and error detection & correction codes; Basic logic operations -NOT, OR, AND, Universal building blocks, EX-OR, EX-NOR - Gates, Standard SOP and POS, Forms, Gray code, error detection, error correction codes (parity checking, even parity, odd parity, Hamming code, NAND-NAND and NOR-NOR realizations

Unit – II

Minimization Techniques:

Boolean theorems, principle of complementation & duality, De-morgan theorems, minimization of logic functions using Boolean theorems, minimization of switching functions using K-Map up to 6 variables, tabular minimization, problem solving (code-converters using K-Map etc..).

Unit – III

Combinational Logic Circuits Design:

Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders, 4bit binary subtractor, adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit, looka-head adder circuit, Design of decoder, demultiplexer, 7 segment decoder, higher order demultiplexing, encoder, multiplexer, higher order multiplexing, realization of Boolean functions using decoders and multiplexers, priority encoder, 4-bit digital comparator.

Unit – IV

Introduction of PLD's:

PROM, PAL, PLA-Basics structures, realization of Boolean function with PLDs, programming tables of PLDs, merits & demerits of PROM, PAL, PLA comparison, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA.

Unit – V

Sequential Circuits I:

Classification of sequential circuits (synchronous and asynchronous); basic flip-flops, truth tables and excitation tables (nand RS latch, nor RS latch, RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals). Conversion from one flip-flop to flip-flop. Design of ripple counters, design of synchronous counters, Johnson counter, ring counter. Design of registers - Buffer register, control buffer register, shift register, bi-directional shift register, universal shift register

Unit – VI

Sequential Circuits II:

Finite state machine; Analysis of clocked sequential circuits, state diagrams, state tables, reduction of state tables and state assignment, design procedures. Realization of circuits using various flip-flops. Mealy to Moore conversion and vice-versa.

Course Outcomes:

- To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, binary codes and error detecting and correcting binary codes.
- To study the theory of Boolean algebra and to study representation of switching functions using Boolean expressions and their minimization techniques.
- To study the combinational logic design of various logic and switching devices.
- To study the sequential logic circuits design both in synchronous and Asynchronous modes for various complex logic and switching devices, their minimization techniques.
- To study some of the programmable logic devices and their use in realization of switching functions.
- To study FSM of both in synchronous and Asynchronous modes and conversion between them.

Text Books:

- 1. Switching Theory and Logic Design by Hill and Peterson Mc-Graw Hill TMH edition.
- 2. Switching Theory and Logic Design by A. Anand Kumar
- 3. Digital Design by Mano PHI.

References:

- 1. Modern Digital Electronics by RP Jain, TMH.
- 2. Fundamentals of Logic Design by Charles H. Roth Jr, JaicoPublishers.
- 3. Micro electronics by Milliman MH edition.