2/4 B.Tech - FOURTH SEMESTER

EC4T3

Switching Theory and Logic Design

Credits: 4

Lecture : 4 periods/week	Internal assessment: 30 marks
Tutorial: 1 period /week	Semester end examination: 70 marks

Course Objectives:

- 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 and their realization.
- To study the sequential logic circuits design both in synchronous and Asynchronous modes for various complex logic and switching devices, their minimization techniques and their realizations.
- To study some of the programmable logic devices and their use in realization of switching functions.

UNIT- I

Number Systems & Codes: Philosophy of number systems – complement representation of negative numbers-binary arithmetic-binary codes-error detecting & error correcting codes –hamming codes.

UNIT- II

Boolean Algebra and Switching Functions: Fundamental postulates of Boolean Algebra - Basic theorems and properties - switching functions–Canonical and Standard forms-Algebraic simplification digital logic gates, properties of logic gates –universal gates-Multilevel NAND/NOR realizations.

UNIT- III

Minimisation of switching functions: Minimisation of switching functions using K-Map up to 6-variables, Tabular Method, Prime –Implicant chart, simplification rules.

UNIT- IV

Combinational Logic Design

Design using conventional logic gates, Encoder, Decoder, Multiplexer, De-Multiplexer, Modular design using IC chips, MUX Realization of switching functions Parity bit generator, Code-converters.

UNIT- V

Programmable Logic Devices: PROM, PLA, PAL, realization of switching functions using PROM, PLA and PAL; comparison of PROM, PLA, and PAL, Programming tables of PROM, PLA and PAL.

UNIT- VI

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 of flip-flop to flip-flop. Design of ripple counters, design of synchronous counters, Johnson counters, ring counters. Design of registers, Buffer register, control buffer register, shift register, bi-directional shift register.

Sequential Circuits - II: Finite state machine, capabilities and limitations, analysis of clocked sequential circuits, design procedures, reduction of state tables and state assignment. Realization of circuits using various flip-flops. Mealy to Moore conversion and vice-versa.

UNIT- VIII

Asynchronous sequential logic: Analysis and Design – Race conditions and Cycles – Hazards in combinational circuits – Hazard free realization.

Learning Resources

Text Books:

- 1. Digital Design Morris Mano, PHI, 4th Edition, 2008.
- 2. Switching & Finite Automata theory Zvi Kohavi, TMH, 3rd Edition, 2011.

References:

- 1. An Engineering Approach To Digital Design Fletcher, PHI, 2009.
- 2. Digital Logic Application and Design John M. Yarbrough, Thomson, 2006.
- 3. Fundamentals of Logic Design Charles H. Roth, Thomson Publications, 5th Edition, 2009.