2/4 B.Tech. FIRST SEMESTER

EE3T4 SWITCHING THEORY AND LOGIC DESIGN Credits: 4

Lecture: 4periods/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.

Learning Outcomes:

- Students will be aware of theory of Boolean Algebra & the underlying features of various number systems.
- Students will be able to use the concepts of Boolean Algebra for the analysis & design of various combinational & sequential logic circuits.
- Students will be able to design various logic gates starting from simple ordinary gates to complex programmable logic devices & arrays.

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, universal shift register.

UNIT VII 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. Melay 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.

TEXT BOOKS:

1. Switching Theory Logic design by Hill and Peterson McGraw Hill MH edition
2. Digital Design – Morris Mano, PHI, 4th Edition, 2008.
3. Modern digital electronics by RP Jain, TMH publishers.

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.
4. Micro electronics by Millman , McGraw Hill MH edition