CS 203

LOGIC AND SWITCHING THEORY

Course objective:

- To introduce number systems and operation of electronic logic elements
- To introduce minimization of Boolean functions and implementation using NAND and NOR Gates.
- To introduce the design of combinatorial and sequential circuits.
- To introduce design of registers and counters.

UNIT-I

Digital Computers and Information: Information representation, Computer Structure.

Number Systems: Binary Numbers, Octal and Hexadecimal Numbers, Number Ranges.

Arithmetic Operations: Conversion from Decimal to other bases. **Decimal Codes:** BCD Addition. Alphanumeric Codes: ASCII Character Code, Parity Bit.

Binary Logic and Gates: Binary Logic, Logic Gates. Boolean Algebra: Basic Identifiers, Algebraic Manipulation, Complement of a Function.

Standard Forms: Minterms and Maxterms, Sum of Product and Products of Sums.

UNIT-II

Minimization of Switching Functions: Introduction, the map method, Minimal Functions and Their Properties, the tabulation procedure, the prime implicant chart.

NAND and NOR Gates: Nand Circuits, Two-level Implementation, Multilevel NAND Circuits, NOR Circuits. Exclusive OR Gates: Odd Function, Parity Generation and Checking.

UNIT-III

Combination Logic Design: Combinational Circuits, Design Topics: Design Hierarchy, Top – Down design, Computer Aided Design, Hardware Description Languages, Logic Synthesis. Analysis Procedure: Derivation of Boolean Functions, Derivation of the Truth Table, Logic Simulation, Design Procedure, Decoders, Encoders, Multiplexers, Binary Adders, Binary subtraction, Binary Multipliers, HDL Representations- VHDL.

UNIT-IV

Sequential Circuits: Sequential Circuit definitions. Latches, Flip Flops, sequential circuit analysis, sequential circuit design, design with D Flip Flops, designing with JK Flip- Flops, HDL representation for sequential circuits-VHDL.

UNIT-V

Registers and Counters: Registers, Shift registers, Synchronous Binary counters, Ripple Counter.

Symmetric Networks: Properties of Symmetric Functions, Synthesis of Symmetric networks, identification of symmetric functions.

Suggested Reading:

1.M. Moris Mano, Charles R. Kime, *Logic and Computer Design Fundamentals,* 2nd edition, Pearson Education Asia, 2001.

2.ZviKohavi, *Switching and Finite Automata Theory,* 2nd edition, Tata McGraw Hill, 1995.

3.Charles H. Roth, J*r Fundamentals of Logic Design,* 5th edition, Thomson, Brook,Cole, 2005.