EOPC2006 DIGITAL SYSTEM DESIGN (3-0-0)

Course Objective:

- To provide a comprehensive understanding of number systems, binary codes, and their applications in digital electronics.
- To develop skills in Boolean algebra and logic gate analysis for solving digital logic problems.
- To equip students with knowledge of combinational and sequential logic design techniques.
- To introduce students to memory systems, programmable logic, and hardware description languages like Verilog/VHDL.

MODULE – I (6 Hours)

Number System: Introduction to various number systems and their Conversion. Arithmetic Operation using 1's and 2`s Compliments, Signed Binary and Floating-Point Number Representation Introduction to Binary codes and their applications.

Boolean Algebra and Logic Gates: Boolean algebra and identities, Complete Logic set, logic gates and truth tables. Universal logic gates, Algebraic Reduction and realization using logic gates.

MODULE – II (8 Hours)

Combinational Logic Design: Sum of product & product of sums, K-Maps: Two, Three and Four variable K-maps, Quine-McCluskey's method, NAND and NOR Logic Implementations.

Logic Components: Concept of Digital Components, Binary Adders, Subtraction and Multiplication, An Equality Detector and Comparator, Decoder, Encoders, Multiplexers and De-multiplexers.

MODULE – III (6Hours)

Synchronous Sequential logic Design: sequential circuits, storage elements: Latches (SR, D), Storage elements: Flip-Flops inclusion of Master-Slave, characteristics equation and state diagram of each FFs and Conversion of Flip-Flops. Analysis of Clocked Sequential circuits and Mealy and Moore Models of Finite State Machines**.**

MODULE – IV (6 Hours) Binary Counters: Introduction, Principle and design of synchronous and asynchronous counters, Design of MOD-N counters, Ring counters. Decade counters, State Diagram of binary counters.

Shift registers: Principle of 4-bit shift registers. Shifting principle, Timing Diagram, SISO, SIPO, PISO and PIPO registers.

MODULE – V (4 Hours)

Programmable Logic Devices: Operation and Circuit implementation of PROM, PAL, PLA.

IC Logic Families: Properties DTL, RTL, TTLand CMOS and its gate level implementation. A/D converters and D/A converters**.**

College Level (20%) Basic hardware description language: Introduction to Verilog/VHDL programming language, Verilog/VHDL program of logic gates, adders, Subtractors, Multiplexers, Comparators, Decoders flip-flops, counters, Shift resistors.

Course Outcomes:

After the completion of this course, students will be able to:

CO1: Understand the representation of number systems, binary codes, and Boolean algebra for logic circuit design.

CO2: Design and simplify combinational logic circuits using tools like K-maps and Quine-McCluskey methods.

CO3: Analyze and construct sequential circuits using flip-flops, state diagrams, and finite state machine models.

CO4: Design counters, shift registers, and memory components while understanding programmable logic devices.

CO5: Develop, simulate, and implement basic digital systems using Verilog/VHDL programming.

Books:

1. Digital Design, 3rd Edition, Moris M. Mano, Pearson Education.
2. Fundamentals of digital circuits, 8th edition, A. Anand Kumar, PHI
3. Digital Fundamentals, 5th Edition, T.L. Floyd and R.P. Jain, Pearson Education, New Delhi.

Reference Book:

1. Digital Electronics, G. K. Kharate, Oxford University Press.
2. Digital Systems – Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.
3. A First Course in Digital System Design: An Integrated Approach, India Edition, John P. Uyemura, PWS Publishing Company, a division of Thomson Learning Inc.
4. Digital Systems – Principles and Applications, 10th Edition, Ronald J. Tocci, Neal S. Widemer and Gregory L. Moss, Pearson Education.