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, 8^{th} 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.