18MC105 DIGITAL COMPUTER FUNDAMENTALS

Course Description and Objective:

The course aims to teach a student the fundamental components used in a Digital Computer and its functioning.

Course Outcomes:

The Student will be able to:

➢ Identify the logic gates and their functionality.
➢ Perform number conversions from one system to another system.
➢ Design basic electronic circuits(combinational circuits).
➢ Perform a comparative analysis of the components of different memory units.

Skills:

• Perform number conversions.
• Synthesize boolean algebra.
• Construct combinational circuits like decoders, encoders, multiplexers etc...
• Analyze counters, shift registers etc...
• Construction of PLA and PLD.

Activities:

• Design of logical circuits using universal gates and basic gates.
• Reduction of Boolean function using K-maps.
• Construction of one-stage ALU circuit.
• Design of the n-bit decoder and encoder.
• Design of combinational circuits using different types of flip-flops.
• Design of PLA for the given Boolean expression.

Syllabus

UNIT – 1   **12 Hours**

NUMBER SYSTEM AND CODES: Decimal Numbers, Binary Numbers, Decimal to binary Conversions, Binary Arithmetic, 1's and 2's complements of Binary Numbers, Signed Numbers, Arithmetic Operations with Signed numbers, Hexadecimal Numbers, Octal Numbers, Digital Codes, Error Detection Codes.

UNIT – 2   **12 Hours**

LOGIC GATES: The Inverter, The AND gate, The OR gate, The NAND gate, NOR gate, The Exclusive–OR gate and Exclusive-NOR gate;Boolean Algebra and Logic Simplification - Boolean Operations and Expressions, Laws and Rules, DeMorgan's Theorems, Boolean Expressions and Truth tables, The Karnaugh Map, SOP minimizations.

UNIT – 3   12 Hours

COMBINATIONAL LOGIC ANALYSIS: Basic combinational Logic Circuits, Implementing Combinational Logic, The Universal Property of NAND and NOR Gates. Functions of Combinational Logic - Basic Adder, Parallel Binary Adders, Comparators, Decoders, Encoders, Code Converters, Multiplexers, Parity Generator/Checkers.

UNIT - 4   12 Hours

LATCHES AND FLIP-FLOPS: Latches, Edge Triggered Flip-Flops, Flip-Flop Operating characteristics, Flip-Flop Applications, Shift Registers,Counters: Asynchronous Counters, Synchronous counters.

UNIT - 5   12 Hours

MEMORY AND STORAGE: Memory Basics, The RAM, The ROM, Programmable ROMs, The Flash Memory, Memory Expansion, Special Types of Memories, Magnetic and Optical Storage, PLDs – PROM, PAL and PLA.

Text Book:

Floyd, Thomas L, "Digital Computer Fundamentals", 10th Edition, University Book Stall, 1997.

Reference Books:

1. Malvino, Paul Albert and Leach, Donald P, "Digital Principles and Applications", 4thEdition, TMH, 2000.
2. Malvino, Paul Albert and Leach, Donald P, "Digital Computer Fundamentals", 3rdEdition, TMH, 1995.
3. Bartee, Thomas C, "Digital Computer Fundamentals", 6th Edition, TMH, 1995.