

COMPUTER ORGANIZATION AND ARCHITECTURE (3-0-0)

Course Objectives

- To understand the basic structure and functional units of a computer system.
- To learn internal data representation and arithmetic operations.
- To understand CPU organization and instruction execution cycle.
- To study memory hierarchy and I/O organization.
- To introduce basic assembly language programming concepts.

Module - I (08 Hours)

Functional Units of a Computer, Von Neumann Architecture, Harvard Architecture, Basic Operational Concepts, Instruction Execution Cycle, System Bus Structure (Data, Address, Control Bus), Performance Metrics (Clock speed, CPI, MIPS – basic idea)

Module - II (08 Hours)

Number Systems (Binary, Octal, Decimal, Hexadecimal), Number System Conversions, Signed and Unsigned Numbers, 1's and 2's Complement Representation, Fixed Point and Floating-Point Representation, Binary Addition and Subtraction, Introduction to Multiplication and Division Algorithms

Module – III (08 Hours)

Register Organization, Arithmetic Logic Unit (ALU), Instruction Formats, Addressing Modes, Instruction Set Architecture (ISA), RISC vs CISC Architecture, Introduction to Pipelining (Basic Concept)

Module – IV (08 Hours)

Memory Hierarchy, Cache Memory, Mapping Techniques: Direct, Associative, Set-Associative, Main Memory (RAM, ROM and types), Virtual Memory Concept, Secondary Storage Devices, Memory Access Time and Performance

Module – V (08 Hours)

Input/Output Devices, I/O Interface, Programmed I/Interrupt Driven I/Direct Memory Access (DMA), Overview of Parallel Processing (Basic Idea)

Course Outcomes (COs):

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

- CO1: Explain the basic structure and working of a computer system.
- CO2: Perform number system conversions and binary arithmetic operations.
- CO3: Describe CPU organization and instruction formats.
- CO4: Analyze memory hierarchy and cache organization.
- CO5: Explain I/O organization and write simple assembly language programs.

Text Books:

1. M. Morris Mano – Computer System Architecture, PHI
2. V. C. Hamacher, Z. G. Veranasic, and S. G. Zaky, Computer Organization, Tata McGraw Hill

Reference Book:

1. William Stallings, Computer Organization and Architecture — Designing for Performance, Pearson Education