

## MCA107: Advanced Computer Architecture

### Teaching Scheme

Lectures: 3 hrs/Week  
Tutorials: 1 hr/Week

Credits: 4

### Examination Scheme

Unit Test -12Marks  
Teachers Assessment - 6Marks  
Attendance - 12 Marks  
End Semester Exam - 70 marks

**Prerequisite:** - Basic knowledge of computer

### Course Objectives:

1. To familiarize with digital computer building blocks.
2. To introduce working of a computer at instruction level.
3. To know various processor design.
4. To know the basics of working of I/O operations of a computer.
5. To be familiar with various types of computer memory.
6. To know different memory management techniques.

### Detailed Syllabus

**Introduction:** Logic Gates, Adders, Subtractors, Multiplexer, Decoder, Encoder, IEEE standard for Floating point numbers, Register Transfer Language and notations, Tri-state Buffer, Bus structure, Arithmetic, Logical & Shift Micro operation.

#### UNIT II (10 Hours)

**Processing Unit:** Fundamental Concepts: Micro instruction, Performing arithmetic or Logic Micro operation, Fetching and Storing of a Word in Memory. Execution of Complete Instruction, Microprogram sequencing, Multiple-Bus organization.

#### UNIT III (10 Hours)

**Processor Design:** General register organization, Control Word, Stack Organization, Instruction Format, 0,1,2,3 Address Instructions, Addressing Modes, Data transfer & Manipulations Instructions, Reduced Instruction Set Computer. **I/O organization:** Input-Output Interface, Handshaking, Direct Memory Access

#### UNIT IV (10 Hours)

**Memory Organization:** RAM, ROM, Boot Strap Loader, Cache Memory Mapping Functions, **Virtual Memory:** Virtual Memory: address space and Memory space, Address Mapping using Pages, associative Memory Page Table, Page Replacement, Page Replacement algorithm: Least Recently Used, First in First out, Optimal, Interleaving, Hit Ratio.

#### UNIT V (10 Hours)

Pipelining Review - basic concept of pipeline and two different types of hazards. • Pipeline CPI • Processor Pipeline Hazards • Computer Architecture & Tech Trends • Processor Speed, Cost, Power • Measuring Performance • Benchmarks Standards • Iron Law of Performance • Moore's Law • Amdahl's Law • Lhadma's Law • Gustafson's law

#### UNIT VI (10 Hours)

**SIMD Architecture-** Introduction, Parallel Processing, classification of Parallel Processing, Fine-Grained SIMD Architecture, coarse-Grained SIMD Architecture, MIMD Architecture, RAID

  
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**Text and Reference Books**

1. Computer System Architecture, M. Morris Mano, PHI, 2002, 5th Edition
2. Computer Organization, Vravice, Zaky&Hamacher, TMH Publication, 2001, 3rd Edition
3. Structured Computer Organization, Tannenbaum, PHI, 2008, 2nd Edition.
4. Computer Organization, Stallings, PHI, 2002, 7th Edition.

**Course Outcomes:**

After completing the course, students will be able to:

1. Know various components of a digital computer.
2. Design basic computer instructions
3. Propose a new processor design.
4. Understand the working of input and output devices and device controller.
5. Understand computer memory hierarchy
6. Implement paging and segmentation in computer memory.



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