Computer Organization And Architecture

Subject Code : 18CS4SP06 **Total Contact Hours: 45**
Credits: 03 **L-T-P: 3-0-0**

Prerequisite: Fundamentals of Computer, Programming Languages (C, C++, Java)

Course Objectives:

- To conceptualize the basics of organizational and architectural issues of a digital computer.
- To analyze performance issues in processor and memory design of a digital computer.
- To understand various data transfer techniques in digital computer.
- To analyze processor performance improvement using instruction level parallelism

Unit I: **(6 Hours)**

Basic Structure of Computers

Computer Types, Functional units, Basic operational concepts, Bus Structures, Software, Performance, Multiprocessors and multi computers, Data Representation- Fixed Point Representation, Floating – Point Representation,

Unit II: **(11 Hours)**

Register Transfer and Operations

Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic ,logic, shift operations, Arithmetic logic shift unit, Instruction codes, Computer Registers, Computer instructions, Instruction cycle. Memory instruction, Reference Instructions - Input – Output and Interrupt, STACK organization, Instruction formats, Addressing modes, DATA Transfer and manipulation, Program control, Reduced Instruction Set Computer.

Unit III: **(11 Hours)**

Micro Programmed Control

Control memory, Address sequencing, microprogram example, design of control unit, hard wired control, Microprogrammed control, Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations, Decimal Arithmetic operations.

Unit IV: **(11 Hours)**

Memory & I/O Organizations

Basic concepts, semiconductor RAM memories, Read-only memories, Cache memories, considerations, Virtual memories, secondary storage

Peripheral Devices, Input-Output Interface, Asynchronous data transfer Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP), Serial communication, Introduction to peripheral component, Introduction to standard serial communication protocols like RS232

Unit V: **(6 Hours)**

Case Study

1. Wombat 1 CPU and JVM using CPUSim.

*CPUSim is a freeware tool for simulation of Computer system

2. Pentium 4- Instruction cycle, Pipelining, Memory System

3. Athlon – General Architecture, Generations, Instruction set (3DNow), CPU Cache

There can be THREE Case studies. Two on commercial processors and one on understanding/designing simple machine using simulation tool.

Course Outcomes:

At the end of the course, students will be able to:

- Understand basic structure of computer and instruction sets.
- Perform computer arithmetic operations.
- Write control signals for any operations.
- Understand the concept of cache mapping techniques.
- Conceptualize the I/O organization and its registers.

Text Books:

1. Computer Organization – Carl Hamacher, ZvonksVranesic, SafeaZaky, Vth Edition, McGraw Hill.

2. Computer Systems Architecture – M.Moris Mano, IIIrd Edition, Pearson/PHI.

Reference Books:

1. Computer Organization and Architecture – William Stallings Sixth Edition, Pearson/PHI
2. Structured Computer Organization – Andrew S. Tanenbaum, 4th Edition, PHI/Pearson.
3. Fundamentals of Computer Organization and Design, -SivaraamaDandamudi, Springer Int. Edition.
4. Computer Architecture a quantitative approach, John L.Hennessy and David A. Patterson, Fourth Edition, Elsevier