21CSE05	COMPUTER ARCHITECTURE	L	T	P	C
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Course Objectives:

Students undergoing this course are able to

• To learn the basic structure and operations of a computer.

• To learn the arithmetic and logic unit and the basics of pipelined execution.

• To understand parallelism and multi-core processors.

• To understand the memory hierarchies, cache memories and virtual memories and I/O devices.

UNIT I	BASIC STRUCTURE OF A COMPUTER SYSTEM	9 Hours

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations – decision making – MIPS Addressing.

UNIT II	ARITHMETIC FOR COMPUTERS	9 Hours

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Subword Parallelism

UNIT III	PROCESSOR AND CONTROL UNIT	9 Hours

A Basic MIPS implementation – Building a Datapath – Control Implementation Scheme – Pipelining – Pipelined datapath and control – Handling Data Hazards & Control Hazards – Exceptions.

UNIT IV	MEMORY & I/O SYSTEMS	9 Hours

Memory Hierarchy - memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB's – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits - USB.

UNIT V	PARALLELISIM	9 Hours

Parallel processing challenges – Flynn's classification – SISD, MIMD, SIMD, SPMD, and Vector Architectures - Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message-Passing Multiprocessors.

UNIT VI	RECENT TRENDS	

Case Study on Multiprocessor architecture: Overview of Shared Memory architecture, Distributed architecture.

Course Outcomes:

On Completion of the course, the students should be able to

- Understand the basic structure of Computers, Operations and Instructions.
- Design Arithmetic and Logic Unit.
- Understand Pipelined Execution, Design Control Unit and Memory Systems and I/O Communication

Text books:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.

Reference books:

1. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.