21CS304PC   **COMPUTER ORGANIZATION AND ARCHITECTURE**   **L   T   P   C**
                                                                    3   0   0   3

COURSE OBJECTIVES:

- The purpose of the course is to introduce principles of computer organization and the basic architectural concepts.
- It begins with basic organization, design, and programming of a simple digital computer and introduces simple register transfer language to specify various computer operations.
- Topics include computer arithmetic, instruction set design, microprogrammed control unit, pipelining and vector processing, memory organization and I/O systems, and multiprocessors

COURSE OUTCOMES:

After Completion of the course, the student should be able to:
    CO1: Interpret the Functional Architecture of Computing Systems.
    CO2: Demonstrate the Register Transfer Language and Implementation of Microoperations.
    CO3: Impart the Knowledge on microprogramming.
    CO4: Explore Data Representation Process and Arithmetic Algorithms.
    CO5: Explore Memory, Control and I/O Functions.
    CO6: Analyze Concepts of Parallelism and Multiprocessing Systems.

UNIT - I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.
Register Transfer Language and Micro operations: Register Transfer language, Register Transfer, Bus and memory transfers, Arithmetic Micro operations, logic micro operations, shift micro operations, Arithmetic logic shift unit.
Basic Computer Organization and Design: Instruction codes, Computer Registers Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, input – Output and Interrupt.

UNIT - II

Microprogrammed Control: Control memory, Address sequencing, micro program example, design of control unit.
Central Processing Unit: ALU, General Register Organization, Instruction Formats, Addressing modes, Data Transfer and Manipulation, Program Control, data-path, control unit.

UNIT - III

Data Representation: Data types, Complements, Fixed Point Representation, Floating Point Representation.
Computer Arithmetic: Addition and subtraction, multiplication Algorithms, Division Algorithms, Floating – point Arithmetic operations. Decimal Arithmetic unit, Decimal Arithmetic operations.

UNIT - IV

Input-Output Organization: Input-Output Interface (Interrupt and DMA mode), Asynchronous data transfer, Modes of Transfer, Priority Interrupt Direct memory Access.

Memory Organization: Memory Hierarchy, Main Memory, secondary storage, Auxiliary memory, Associate Memory, Cache Memory.

UNIT - V

Reduced Instruction Set Computer: CISC Characteristics, RISC Characteristics.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processor.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor arbitration, Interprocessor communication and synchronization, Cache Coherence.

TEXT BOOK:

1. M. Morris Mano, Computer System Architecture, Third Edition, Pearson, 2007.

REFERENCE BOOKS:

1. Carl Hamacher, Zvonks Vranesic, Safwat Zaky, Computer Organization, 5th Edition, McGraw Hill, 2017.
2. William Stallings, Computer Organization and Architecture, 10th Edition, Pearson, 2016.
3. Andrew S. Tanenbaum, Structured Computer Organization, 6th Edition, Pearson, 2016.