INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

COMPUTER SYSTEM ARCHITECTURE								
III Semester: CSE / IT / CSIT / CSE (AI&ML) / CSE (DS) / CSE (CS)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
AECD04	**Core**	3	0	0	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisites: There are no prerequisites to take this course								

I. COURSE OVERVIEW:
This course is designed to provide students with a deep understanding of the fundamental principles that govern the design and operation of computer systems. The Course covers the organization of computer systems, memory management, I/O management, and multiprocessor systems. The course forms the basis for advanced studies and research in areas such as computer engineering, and related disciplines.

II. COURSE OBJECTIVES:
The students will try to learn:

I. The concepts of register transfer logic and arithmetic operations, instruction format, and instruction cycle.
II. The basic components of computer systems, functionality, and interactions with the components
III. Memory hierarchy, memory management, and I/O management.
IV. Pipelining and Multiprocessor techniques for the improvement of efficiency

III. COURSE OUTCOMES:
After successful completion of the course, students should be able to:

CO1 Demonstrate a thorough understanding of the basic concepts and principles of computer system architecture.
CO2 Analyze different types of instruction sets and addressing modes.
CO3 Evaluate memory management techniques such as paging, segmentation, and virtual memory.
CO4 Compare different I/O techniques, including programmed I/O, interrupt driven I/O, and direct memory access (DMA)
CO5 Explore the implications of parallel processing and apply concepts of pipelining and parallelism to enhance system performance.

IV. COURSE CONTENT:

MODULE – I: REGISTER TRANSFER AND MICROOPERATIONS (10)
Register transfer, Bus, and memory transfers, Arithmetic microoperations, Logic microoperations, Shift microoperations, and Arithmetic logic shift unit. Computer arithmetic: Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.

MODULE – II: ORGANIZATION OF A COMPUTER (09)
Instruction codes, Computer registers, Computer instructions, Timing and control, Instruction cycle, Program Input-Output and Interrupt. Instruction formats, Addressing modes, Data Transfer and Manipulation, Program Control, RISC.

MODULE – III: MICROPROGRAMMED CONTROL AND INPUT-OUTPUT ORGANIZATION (10)
Micro Programmed Control: Control memory, Address sequencing, Design of control unit, Hardwired control, Micro programmed control.

Input-Output Organization: Peripheral devices, Input-Output interface, Modes of transfer, Priority interrupt – Daisy chaining priority, Parallel priority interrupt, Priority encoder; Direct Memory Access, Input-Output Processor – CPU-IOP communication; PCI Express - PCI physical and logical architecture.

MODULE - IV: MEMORY ORGANIZATION (09)
Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory; Semiconductor RAMs – Internal organization, Static memories, Dynamic RAMs, Synchronous and Asynchronous DRAMs, Structure of larger memories; Read-only memories, Cache memories – Mapping functions; Nonvolatile Solid-State Memory Technologies, Solid state drives.

MODULE – V: MULTIPROCESSORS (09)
Pipeline and Vector Processing: Parallel processing, Pipelining, Instruction pipeline, Vector processing, Array processors. Multiprocessors: Characteristics of multiprocessors, Interconnection structures, Inter-processor arbitration. Multicore Computers: Hardware performance issues, Software performance issues, Multicore organization, Intel Core i7-990X.

V. TEXTBOOKS:

1. M. Morris Mano, "Computer Systems Architecture", Pearson, 3rd edition, 2015.
2. Patterson, Hennessy, "Computer Organization and Design: The Hardware/Software Interface", Morgan Kaufmann, 5th edition, 2013.

VI. REFERENCE BOOKS:

1. John. P. Hayes, "Computer System Architecture", McGraw-Hill, 3rd edition, 1998.
2. Carl Hamacher, Zvonko G Vranesic, Safwat G Zaky, "Computer Organization", McGraw-Hill, 5th edition, 2002.
3. William Stallings, "Computer Organization and Architecture", Pearson Edition, 8th edition, 2010.

VII. WEB REFERENCES:

1. https://www.tutorialspoint.com/computer_logical_organization/
2. https://www.courseera.org/learn/comparch
3. https://www.cssimplified.com/computer-organization-and-assembly-language-programming