COMPUTER ORGANIZATION AND ARCHITECTURE

III Semester: CSE / IT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
ACS004	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Understand the organization and architecture of computer systems and electronic computers.
II. Study the assembly language program execution, instruction format and instruction cycle..
III. Design a simple computer using hardwired and micro programmed control methods..
IV. Study the basic components of computer systems besides the computer arithmetic
V. Understand input-output organization, memory organization and management, and pipelining.

COURSE LEARNING OUTCOMES (CLOs):

1. Describe the various components like input/output units, memory unit, control unit, arithmetic logic unit connected in the basic organization of a computer.
2. Understand the interfacing concept with memory subsystem organization and input/output subsystem organization.
3. Understand instruction types, addressing modes and their formats in the assembly language programs.
4. Describe the instruction set architecture design for relatively simple microprocessor or Central Processing Unit.
5. Classify the functionalities of various micro operations such as arithmetic, logic and shift micro operations.
6. Understand the register transfer languages and micro operations involved in bus and memory transfers.
7. Describe the design of control unit with address sequencing and microprogramming Concepts.
8. Understand the connections among the circuits and the functionalities in the hardwired control unit.
9. Describe the various phases involved in the instruction cycle viz. fetching, decoding, reading effective address and execution of instruction.
10. Describe various data representations and explain how arithmetic and logical operations are performed by computers.
11. Classify the various instructions formats to solve the arithmetic expressions in different addressing modes.
12. Understand the functionality of various instruction formats for writing assembly language programs.
13. Describe the implementation of fixed point and floating point addition, subtraction operations.
14. Understand the concept of memory hierarchy and different typed of memory chips.
15. Describe various modes of data transfer between CPU and I/O devices
16. Understand the virtual memory concept with page replacement concept in memory organization
17. Describe the hardware organization of associate memory and understand the read and write operations
18. Describe the parallel processing concept with multiple functional units.
19. Understand the multiprocessor concept with system bus structure and the concept of inter processor communication and synchronization.
20. Understand the different priority interrupts in the input-output organization in the computer

architecture.

21. Possess the knowledge and skills for employability and to succeed in national and international level competitive examinations.
22. Possess the knowledge and skills to design advanced computer architecture for current industry requirements

Unit-I	**INTRODUCTION TO COMPUTER ORGANIZATION**	**Classes: 08**

Basic computer organization, CPU organization, memory subsystem organization and interfacing, input or output subsystem organization and interfacing, a simple computer levels of programming languages, assembly language instructions, instruction set architecture design, a simple instruction set architecture.

Unit -II	**ORGANIZATION OF A COMPUTER**	**Classes: 10**

Register transfer: Register transfer language, register transfer, bus and memory transfers, arithmetic micro operations, logic micro operations, shift micro operations; Control unit: Control memory, address sequencing, micro program example, and design of control unit.

Unit -III	**CPU AND COMPUTER ARITHMETIC**	**Classes: 08**

CPU design: Instruction cycle, data representation, memory reference instructions, input-output, and interrupt, addressing modes, data transfer and manipulation, program control.
Computer arithmetic: Addition and subtraction, floating point arithmetic operations, decimal arithmetic unit.

Unit -IV	**INPUT-OUTPUT ORGANIZATION AND MEMORY ORGANIZATION**	**Classes: 10**

Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory; Input or output organization: Input or output Interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access.

Unit -V	**MULTIPROCESSORS**	**Classes: 09**

Pipeline: Parallel processing, pipelining-arithmetic pipeline, instruction pipeline; Multiprocessors: Characteristics of multiprocessors, inter connection structures, inter processor arbitration, inter processor communication and synchronization.

Text Books:

1. M. Morris Mano, “Computer Systems Architecture”, Pearson, 3rd Edition, 2007.
2. John D. Carpinelli, “Computer Systems Organization and Architecture”, Pearson, 1st Edition, 2001.
3. Patterson, Hennessy, “Computer Organization and Design: The Hardware/Software Interface”, Morgan Kaufmann, 5th Edition, 2013.

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.

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
E-Text Books:
1. https://www.groupes.polymtl.ca/inf2610/.../ComputerSystemBook.pdf 2. https://www.cse.hcmut.edu.vn/~vtphuong/KTMT/Slides/TextBookFull.pdf