SIGMA UNIVERSITY VADODARA

Faculty of Computer Science & Applications
Master of Computer Application (MCA)
(W. E. F.: 2023-24)

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Name of Faculty	:	**Faculty of Computer Science & Applications**
Name of Program	:	Master of Computer Application (MCA)
Course Code	:	1MCA06
Course Title	:	Computer Organization and Architecture
Type of Course	:	Professional Couse
Year of Introduction	:	2023-24

Prerequisite	:	-
Course Objective	:	Understanding the Computer Design, Organization and Architecture
Course Outcomes	:	At the end of this course, students will be able to:
	CO 1	Identify and explain the basic structure and functional units of a digital computer.
	CO 2	Write assembly language programs and identify the role and working of various functional units of a computer for executing an instructions.
	CO 3	Design processing unit using the concepts of ALU and control logic design.
	CO 4	Design circuits for interfacing memory and I/O with processor.
	CO 5	Comprehend the features and performance parameters of different types of computer architectures.

Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
				Theory Marks		Practical Marks		Total Marks
L	**T**	**P**	**C**	**SEE**	**CIA**	**SEE**	**CIA**	
2	2	0	3	70	30	0	0	100

*Legends: **L**-Lecture; **T**–Tutorial/Teacher Guided Theory Practice; **P**–Practical, **C** – Credit, **SEE** – Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.))*

Course Content

Unit No,	Topics	Teaching Hrs.	Weightage	Mapping with CO
1	**Computer Data Representation:** Basic computer data types, Complements, Fixed point representation, Register Transfer and Micro-operations: Floating point representation, Register Transfer language, Register Transfer, Bus and Memory Transfers (Tree-State Bus Buffers, Memory Transfer), Arithmetic Micro-Operations, Logic Micro-Operations, Shift Micro-Operations, Arithmetic logical shift unit	4	10%	CO1

2	**Basic Computer Organization and Design:** Instruction codes, Computer registers, computer instructions, Timing and Control, Instruction cycle, Memory-Reference Instructions, Input-output and interrupt, Complete computer description, Design of Basic computer, Design of Accumulator Unit.	4	10%	CO1
3	**Assembly Language Programming:** Introduction, Machine Language, Assembly Language Programming: Arithmetic and logic operations, looping constructs, Subroutines, I-O Programming.	8	10%	CO2
4	**Micro programmed Control Organization:** Control Memory, Address sequencing, Micro program example, Design of Control Unit	4	10%	CO3
5	**Central Processing Unit:** Introduction, General Register Organization, Stack Organization, Instruction format, Addressing Modes, Data transfer and manipulation, Program control, Reduced Instruction Set Computer (RISC) & Complex Instruction Set Computer (CISC)	5	10%	CO 4
6	**Pipeline And Vector Processing:** Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors	5	10%	CO4
7	**Computer Arithmetic:** Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit.	4	10%	CO2 CO4
8	**Input-Output Organization:** Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPUIOP Communication, Serial communication.	4	10%	CO5
9	**Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.	6	10%	CO5
10	**Multiprocessors:** Characteristics of Multiprocessors, Interconnection Structures, Inter-processor Arbitration, Inter-processor Communication and Synchronization, Cache Coherence, Shared Memory Multiprocessors.	**4**	10%	CO5

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	**50%**	**50%**	**-**	**-**	**-**	**-**

NOTE: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Suggested List of Experiments/Tutorials

Sr. No.	Name of Experiment/Tutorials	Teaching Hours
1.	Implement Booth's Algorithm	04
2.	Write the working of 8085 simulator GNUsim8085 and basic architecture of 8085 along with small introduction.	04
3.	Write an assembly language code in GNUsim8085 to store numbers in reverse order in memory location.	04
4.	Write an assembly language code in GNUsim8085 to implement arithmetic instruction	04
5.	Write an assembly language code in GNUsim8085 to find the factorial of a number.	04
6.	Write an assembly language code in GNUsim8085 to implement logical instructions.	04
7.	Design ALU using Logisim.	04
8.	Implement 16-bit single-cycle MIPS processor in Verilog HDL	04

Major Equipment/ Instruments and Software Required

Sr. No.	Name of Major Equipment/ Instruments and Software
1	Logisim, GNUsim8085

Reference Books

Sr. No.	Name of Reference Books
1	Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, PHI.
2	Fundamental of Algorithms by Gills Brassard, Paul Bratley, PHI.
3	Introduction to Design and Analysis of Algorithms, Anany Levitin, Pearson.
4	Foundations of Algorithms, Shailesh R Sathe, Penram
5	Design and Analysis of Algorithms, Dave and Dave, Pearson.