GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Vocation (B.Voc)
Semester: III
Branch: Software Development
Subject Name: Computer Organization and Architecture
Subject Code: 21130202

Type of course: Core Course

Prerequisite: None

Rationale:

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical		
L	T	P	C	ESE (E)	PA(M)	ESE (V)	PA (I)	
3	0	0	3	50	0	0	0	50

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Contents:

Sr. No.	Practical / Hands on Exercise	Teaching Hrs.	Weightage
1	**UNIT–I** **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
2	**UNIT–II** **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
3	**UNIT–III** **Assembly Language Programming:** Introduction, Machine Language, Assembly Language Programming: Arithmetic and logic operations, looping constructs, Subroutines	8	20

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4	**UNIT–IV** **Micro programmed Control Organization:** Control Memory, Address sequencing, Micro program example, Design of Control Unit	4	10
5	**UNIT–V** **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
6	**UNIT–VI** **Pipeline And Vector Processing:** Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors	5	10
7	**UNIT–VII** **Computer Arithmetic:** Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit.	4	10
8	**UNIT- VIII** 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
9	**UNIT–IX** **Memory Organization:** Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.	4	10
	Total	**42**	

Reference Books:

1. M. Morris Mano, “Computer System Architecture”, Pearson Education
2. Yale N. Patt, Sanjay J. Patel, “Introduction to Computing Systems” McGraw Hill.
3. Hamacher, Vranesic, Zaky, “Computer Organization”, McGraw Hill.
4. Andrew S. Tanenbaum and Todd Austin, “Structured Computer Organization”, Pearson Education
5. N. D. Jotwani, “Computer system organization”, McGraw Hill
6. R.S.Gaonkar, “Microprocessor Architecture, Programming and Applications with 8085A”, Penram International
7. Douglas Hall, Microprocessors and Interfacing, TMH.

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Suggested Specification table with marks (theory): (For B.VOC only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	0	0	0

Course Outcomes:

Sr. No.	CO Statement	Marks % Weightage
CO-1	Identify and explain the basic structure and functional units of a digital computer.	10
CO-2	Write assembly language programs and identify the role and working of various functional units of a computer for executing instructions.	25
CO-3	Design processing unit using the concepts of ALU and control logic design.	25
CO-4	Design circuits for interfacing memory and I/O with processor.	20
CO-5	Comprehend the features and performance parameters of different types of computer architectures.	20

Laboratory work: NA

List of Open Source Software/learning website:

Students must refer to the following sites to enhance their learning ability.
1) https://tutorialspoint.dev/computer-science/computer-organization-and-architecture
2) NPTEL tutorials
3) www.coursera.org
4) www.udacity.com