

GUJARAT TECHNOLOGICAL UNIVERSITY



Program Name: Bachelor of Engineering

Level: UG

Branch: ALL (Except Electronics and Communication Engineering and Allied Branches)

Subject Code: BE05000511

Subject Name: Computer Organization & Architecture

WEF Academic Year :	2024-25
Semester :	5
Category of the Course :	MOPEC-02

Course Outcome :

After Completion of the Course, Student will able to :

No	Course Outcomes	RBT Level*
01	Identify and explain the basic structure and functional units of a digital computer.	UN
02	Write assembly language programs and identify the role and working of various functional units of a computer for executing an instructions.	AP
03	Design processing unit using the concepts of ALU and control logic design.	AN
04	Design circuits for interfacing memory and I/O with processor.	CR
05	Comprehend the features and performance parameters of different types of computer architectures.	CR

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Teaching and Examination Scheme

Teaching/Learning Scheme in hrs/semester					Total Credits	Assessment Pattern and Marks					Total Marks
L	T	P	PBL*	TH	TH/30	Theory		Practical			
						ESE (E)	PA (M)	PA (I)	PBL(I)	ESE (V)	
45	0	0	15	60	2	70	30	00	30	00	130

Where L = Lecture, T= Tutorial, P= Practical, TW/SL = Term-Work / Self-Learning, TH = Total Hours, ESE = End-Semester Examination, PA = Progressive Assessment

* Problem Based Learning (PBL) aims to accommodate learning beyond syllabus as per clause 9.4 of NBA manual.

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Course Content :

Sr. No.	Content	Total Hrs
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	5
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
3	Assembly Language Programming Introduction, Machine Language, Assembly Language Programming: Arithmetic and logic operations, looping constructs, Subroutines, I-O Programming.	6
4	Micro programmed Control Organization: Control Memory, Address sequencing, Micro program example, Design of Control Unit	4
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
6	Pipeline And Vector Processing Flynn's taxonomy, Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction, Pipeline, RISC Pipeline, Vector Processing, Array Processors	5
7	Computer Arithmetic Introduction, Addition and subtraction, Multiplication Algorithms (Booth Multiplication Algorithm), Division Algorithms, Floating Point Arithmetic operations, Decimal Arithmetic Unit.	5
8	Input-Output Organization Input-Output Interface, Asynchronous Data Transfer, Modes Of Transfer, Priority Interrupt, DMA, Input-Output Processor (IOP), CPU IOP Communication, Serial communication.	5
9	Memory Organization Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Virtual Memory.	6

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This syllabus is mapped with following United Nation's Sustainable Development Goals:

SDG 4 - Quality Education.

SDG 8 - Decent Work and Economic Growth,

SDG 9 - Industry, Innovation and Infrastructure,

SDG 12 - Responsible Consumption and Production,

SDG 13 -Climate Action

Relevant BIS standards:

IS 13252 (Part 1) – Safety of Information Technology Equipment

IS/IEC 60950-1 – IT Equipment Safety

IS/IEC 62368-1 – Audio/Video, IT & Communication Equipment Safety

IS 14700 Series – Electromagnetic Compatibility (EMC)

IS/IEC 61000 Series – EMC Standards

IS 16603 – Data Center Infrastructure Requirements

Also explore other relevant Indian and international standards.

Reference Book :

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.

Activities suggested under Self-learning/Team Work:

Sl. No.	Name of the activity	No. of hours	Evaluation Criteria
1.	Industry/Research laboratory visit	Visit = 5h, Report preparation = 5h Total = 10h	Based on report submitted. Report should contain observations and calculations based on industry/ lab data.
2.	Technical Video based learning related to the subject	Duration of video = 5h Report preparation = 5h Total = 10h	Report /presentation based on the video learning outcomes.

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3.	Assignment writing. Numericals based assignment is preferable.	5 assignments of 2h each. Total = 10h	Based on the assignment submitted.
4.	Problem solving/Coding using C, C++, Python, SCILAB, MATLAB, MS-EXCEL or any other relevant software	5 small coding based assignment of 2h each. Total = 10h	Based on the coding solution submitted.
5.	Self learning on-line course	Minimum duration of the course should be 10h.	Examination based assessment at the end of course. Based on the certificate produced.
6.	Complex problem solving	Maximum 2 problem. Study of the problem and solution finding, Total = 10h	Based on the depth of the solution submitted.
7	Videos on Industrial safety aspects based on subject	Duration of video = 5h Report preparation = 5h Total = 10h	Based on quiz/report submitted
8	Discussion on research paper based on relevant subject	5 research paper = 20 h	Summarize research paper and evaluation critical parameters
9.	Poster/chart/power point preparation on technical topics	Duration = 6 h	Based on poster/chart preparation and presentation skills
10	Working/non-working model on technical topics	Working = 12 h Non- working = 8 h	Based on inter department/external evaluation
11	Industrial exposure for 2-3 days to observe and provide tentative solutions on society/environment/health/any other issue	Duration = 15 h for industrial exposure Problem identification and tentative solution = 10 h Total = 20 h	Based on evaluation of critical problems and solutions
12	Group Discussion on emerging/trending technical topics based on subject	Duration = 1 h each	Based on performance in group discussion, technical depth, knowledge etc.

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13.	Real world case studies-based learning	Duration of data collection/study = 5h Report preparation = 5h Total = 10h	Based on in-depth study, technical depth, data collected, fact finding, etc.
14.	Application/Software development	Duration = 10 h	Depending on the complexity of the Application/Software

Note:

1. All the suggested activity should be related to the subject.
2. The number of hours are suggestive. Faculty can sub-divide the number of hours based on the activity. However, total number of hours is fixed.
3. Rubrics for the evaluation can be prepared by the faculty.

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