



# GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Bachelor of Engineering

Level: UG

Subject Code: BE04000141

Subject Name : Microprocessor and Interfacing

WEF Academic Year:	2024 - 2025
Semester:	4
Category of the Course:	Professional Core Course

<b>Prerequisite :</b>	Students should have in depth knowledge of Digital Logic Design.
<b>Rationale :</b>	Microprocessor 8085 has simple architecture and an adequate instruction set that enables students to learn necessary architecture, programming and interfacing concepts. The concepts are easily transferable from this device to the microcontrollers, which are widely used in the field of industrial automation.

### Course Outcome:

After Completion of the Course, Student will able to:

CO No.	Course Outcome Statement	Bloom's Level
CO-1	Explain the architecture and operation of the 8085 microprocessor, including memory, I/O, and system bus concepts.	(U)
CO-2	Develop and simulate assembly language programs using data transfer, arithmetic, logic, and control instructions.	(A),(C)
CO-3	Implement counters, delays, subroutines, and code conversions using 8085 ALP.	(A)
CO-4	Interface and program peripheral devices such as ADC, DAC, 8255, and 8253 with 8085.	(AN),(A)
CO-5	Troubleshoot and debug memory and I/O interfacing problems using systematic testing methods.	(E),(AN)

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

### Teaching and Examination Scheme:

Teaching - Learning Scheme (in Hours per Semester)					Total Credits = TH/30	Assessment Pattern and Marks					Total Marks
L	T	P	PBL*	TH		Theory		Tutorial / Practical			
						ESE (E)	PA (M)	PA/ (I)	PBL (I)	ESE (V)	
60	0	30	30	120	04	70	30	20	30	50	200

- 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	Percentage
1	<b>Introduction to Microcomputers and Microprocessors</b> Introduction to digital computer, Computer languages, Operating systems, Data representation, Microprocessor organization, Memory, Input/output devices, System bus, Microprocessor controlled temperature system.	4	10%
2	<b>Microprocessor Architecture and Microcomputer Systems</b> Microprocessor 8085 architecture and its operations, Registers, Flags, Memory, Input/output and interfacing devices, Pin diagram, Bus timings, Demultiplexing the address/data bus, Control signals, 8085 based microcomputer, Interfacing memory, Interfacing input & output (I/O) devices, Memory mapped I/O, Testing and Troubleshooting of memory and I/O interfacing circuits.	12	20%
3	<b>Instructions and Timings</b> Programming model, Data transfer, arithmetic, logical, branch and machine control instructions, Instruction format, Addressing modes, Timing diagram of single byte, two byte, three byte instructions.	10	15%
4	<b>Assembly Language Programming (ALP)</b> Looping, counting, and indexing, Programming using data transfer, arithmetic, logical and branching instructions, Counters and time delays, Stack and Subroutine, Code conversion, BCD arithmetic and 16-bit data operations.	16	25%
5	<b>Interrupts</b> Basic understanding of interrupt process, Vector interrupts, Software interrupt.	4	10%
6	<b>Interfacing</b> DAC and ADC, 8255A programmable peripheral interface (PPI) mode 0 and BSR mode, Seven segment multiplexed display and matrix keyboard interfacing using 8255, 8253 programmable interval timer.	14	20%



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## Reference Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085 - Ramesh S. Gaonkar Penram International Publishing (India) Pvt. Ltd.
2. Microcomputers and Microprocessors: The 8080, 8085 and Z-80 Programming, Interfacing and Troubleshooting by John E. Uffenbeck.
3. Microprocessor and Microcontroller fundamentals. The 8085 and 8051 Hardware and Software by William Kleitz.
4. 0000 to 8085 – Introduction to Microprocessors for Engineers and Scientists, P. K. Ghosh and P.R. Shridhar, Prentice hall of India Pvt. Ltd, 2<sup>nd</sup> edition.
5. The 8085 Microprocessor: Architecture, Programming and Interfacing, K. Udaya Kumar and B.S.Umashankar, Pearson Education

## Suggested Course Practical List:

Sr. No.	Practical Title	Mapped CO(s)
1	Introduction to 8085 Microprocessor Trainer Kit and identifying I/O and memory components	CO1
2	Introduction to 8085 Simulator IDE and debugging features like breakpoints and watch registers	CO1
3	Assembly language program using data transfer instructions (MOV, MVI, LXI, etc.)	CO2
4	Assembly language program using arithmetic instructions (ADD, SUB, INR, DCR, etc.)	CO2
5	Assembly language program using logical instructions (ANA, ORA, XRA, CMA, etc.)	CO2
6	Assembly language program using branching and looping instructions (JMP, JNZ, JC, etc.)	CO2, CO3
7	Assembly language program using counters and software delays	CO3
8	Assembly language program using Stack and Subroutine (CALL, RET, PUSH, POP)	CO3
9	Assembly language program for Code Conversion (Binary to BCD, Hex to ASCII, etc.)	CO3
10	Assembly language program for BCD arithmetic and 16-bit operations	CO3
11	Interfacing of ADC with 8085 and displaying analog value in digital format	CO4
12	Interfacing of DAC with 8085 for waveform generation (e.g., ramp/sawtooth)	CO4
13	Interfacing 8255 PPI in Mode 0 and BSR Mode with LED or 7-segment display	CO4
14	Interfacing matrix keyboard using 8255 and writing ALP to detect key pressed	CO4
15	Interfacing and programming of 8253 timer for square wave generation or delay-based control	CO4, CO5



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## List of Laboratory/Learning Resources Required:

- 8085 microprocessor trainer kit with peripheral devices
- Computer system
- CRO, Power supply

## List of Open Source Software/learning website:

- 8085 simulator
- nptel.ac.in

## Activities suggested under Problem Based Learning:

Sr. No.	Name of the Activity	No. of Hours	Evaluation Criteria
1	Watch NPTEL lectures on “8085 Architecture and Programming” and prepare a summary	2 hours	Summary report / Oral viva
2	Study and compare instruction timing diagrams of single, two, and three-byte instructions	2 hours	Written explanation / MCQ quiz
3	Simulate 8085 programs using online/open-source simulators (e.g., GNUSim8085, BCU)	3 hours	Simulation screenshots and output log submission
4	Create and share a tutorial video explaining ALP using arithmetic and logic instructions	3 hours	Peer feedback and faculty review
5	Analyze the working of ADC/DAC interfacing circuits and present a report	3 hours	Report with circuit explanation and block diagram

## Note:

- All the suggested activity should be related to the subject.
- Subject coordinator shall identify activities from above list as per the subject needs, they also declare list of activities wise hours, evaluation scheme and rubrics to students at the start of semester.
- The number of hours is suggestive. Faculty can sub-divide the number of hours based on the activity. However, total number of hours is fixed.
- All records pertaining to the evaluation and assessment of self-learning activities must be properly maintained and preserved at the institute level. These records should be made available to the university upon request.
- Institutes are encouraged to utilize digital platforms, such as Microsoft Teams, for effective record-keeping and to ensure transparency in the evaluation and assessment of self-learning activities.

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