GUJARAT TECHNOLOGICAL UNIVERSITY

INSTRUMENTATION & CONTROL ENGINEERING (17)
Bachelor of Engineering
Subject Code: 3141710
Semester – IV
Subject Name: Microprocessor and Interfacing

Type of course: Professional Core Course

Prerequisite: Students should have in depth knowledge of Digital Logic Design.

Rationale: 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.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

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

Content:

Sr. No.	Content	Total Hrs
1	**Introduction to Microcomputers and Microprocessors** Introduction to digital computer, Computer languages, Operating systems, Data representation, Microprocessor organization, Memory, Input/output devices, System bus, Microprocessor controlled temperature system.	2
2	**Microprocessor Architecture and Microcomputer Systems** 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.	10
3	**Instructions and Timings** 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.	8
4	**Assembly Language Programming (ALP)** 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.	12

5	**Interrupts** Basic understanding of interrupt process, Vector interrupts, Software interrupt.	**4**
6	**Interfacing** 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.	**12**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
0 to 10	**10 to 15**	**10 to 15**	**15**	**10 to 15**	**15 to 20**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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

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, 2nd edition.
5. The 8085 Microprocessor: Architecture, Programming and Interfacing, K. Udaya Kumar and B.S.Umashankar, Pearson Education.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
	After successful completion of the course students should be able to:	
CO-1	Explain various features of microprocessor, memory and I/O devices including concepts of system bus.	20
CO-2	Simulate assembly language program for general purpose automation.	30
CO-3	Apply knowledge of programming to interface memory, keyboard, display and	30

	other input/output devices with microprocessor.	
CO-4	Understand the functionality of various peripheral chips.	20

List of Experiments:

Minimum of 40 programs to be written making effective use of all the instructions, and addressing modes. Among these at least 5 programs must be of stack and subroutine and, 5 programs based on peripheral ICs.

1. Introduction to Microprocessor Trainer Kit and identify the different peripheral devices and operating system on it. Write and execute demo programs.
2. Introduction to 8085 simulator IDE and understand the steps to simulate the program using it. Write and execute demo programs. Explain various debugging techniques like single stepping, break point etc.
3. Assembly language programming using data transfer instructions.
4. Assembly language programming using arithmetic and logical instructions.
5. Assembly language programming using branching and looping instructions on trainer kit.
6. Assembly language programming using counter and time delay on trainer kit.
7. Assembly language programming using stack and subroutine on trainer kit.
8. Assembly language programming for code conversion.
9. Assembly language programming for BCD arithmetic and 16-bit data operations.
10. Interfacing and assembly language programming of ADC and DAC with microprocessor 8085.
11. Interfacing and assembly language programming of 8255 Programmable Peripheral Interfacing (PPI) device with microprocessor 8085.
12. Interfacing and assembly language programming of 8253 programmable counter / timer device with microprocessor 8085.

Major Equipment:

1. 8085 microprocessor trainer kit with peripheral devices
2. Computer system
3. CRO, Power supply

List of Open Source Software/learning website:

8085 simulator.
nptel.ac.in