GUJARAT TECHNOLOGICAL UNIVERSITY

MECHATRONICS ENGINEERING (20)
BASICS OF MICRO COMPUTER SYSTEMS
SUBJECT CODE: 2152006
B.E. 5th SEMESTER

Type of course: Engineering Science

Prerequisite: N.A.

Rationale: Architecture, instruction set and assembly level programming of microprocessor and microcontroller are covered in this course. Also the assembly level programming is explained with proper interfacing.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	**Overview:** From mainframe to microcomputers, from high level to machine languages.	1	-
2	**Microprocessor Architecture and Microcomputer Systems:** Microprocessor, Memory, I/Os and Bus Architecture, The 8085 Microprocessor architecture, buses, registers and flags.	2	5
3	**Programming in 8085:** Introduction to the 8085 instruction set, overview, op-code and operand; one-two-and three byte instructions, loops, indexing and memory reference	5	10
4	**Memory and I/O interfacing:** Memory interfacing, interfacing the 8155, Memory segment, Instruction and machine cycle, T-states and timings, I/O interfacing concepts, Interfacing output displays, Interfacing input Devices, Memory mapped I/O.	10	15
5	**Advanced Instructions and Programming:** Counters and Time Delays, Generating pulse waveforms: Stack Subroutine; Restart, Conditional Call and Return Instructions, Advanced subroutine concepts, Code conversion, BCD arithmetic and 16-bit data operations.	10	15
6	**Interrupt of 8085:** Polling and Interrupt method, Vectored and Non vectored interrupt, Interrupt priority	4	10

8	**The 8051 Microcontroller:** Microcontrollers and Embedded processors, Overview of the 8051 family	**2**	**5**
9	**8051 Assembly language programming:** Inside the 8051, Introduction, Assembling and running program, the program counter and ROM space, Data types and Directives, Flag bits and PSW register, register banks and stack; Jump, Loop and Call instructions, I/O port programming, Addressing Modes, Arithmetic instructions, Logic Instructions, Single-Bit instructions and Programs.	**10**	**20**
10	**Advanced 8051 programming and Math Calculations:** Fixed point numbers, addition of two 16-bit numbers, unsigned 32-bit addition, subtraction of two 16-bit numbers, conversion of 8-bit signed number into a 16-bit signed number, 16-bit signed addition, binary to BCD conversion, square root calculations, Integration, Differentiation, Floating point Arithmetic.	**2**	**10**
11	**8051 Timer /Counter:** 8/16 bit Timer, Timer modes, Timer control register, Programming based on timer	**3**	**5**
12	**8051 Interrupt :** Peripheral interrupt, External interrupt, Interrupt priority, Program based on Interrupt	**3**	**5**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
40	**20**	**20**	**10**	**10**	**-**

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 slightly from above table.

Reference Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085 –Ramesh S. Gaonkar, Penram International publications.
2. Microprocessor 8085 and its Interfacing, By Sunil Mathur, Second Edition, PHI Learning Pvt. Ltd
3. 8085 Microprocessor And its Applications, By A. Nagoor Kani, Third Edition,TMH Education Pvt. Ltd
4. The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2/e by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay, Pearson Education
5. The 8051 Microcontroller & Embedded Systems using Assembly and C By K. J. Ayala, D. V. Gadre, Cengage Learning , India Edition.

Course Outcome:

After learning the course the students should be able to:

1. Understanding the basic building blocks of a micro computing unit (MCU)

2. Understand the architecture, instruction set and assembly level programming of microprocessor and microcontroller
3. Interface memory and I/Os with 8085 and 8051
4. Design systems using microprocessors/microcontrollers

List of Experiments:

1. Introduction to 8085 simulator and 8085 trainer kit.
2. Programming based on data transfer in 8085
3. Programming based on arithmetic operations in 8085
4. Programming based on logical operations in 8085
5. Programming based on advanced operations in 8085
6. Programming based on interrupts in 8085
7. Introduction to 8051 simulator and 8085 trainer kit and programming based on data transfer operations in 8051
8. Programming based on arithmetic operations in 8051
9. Programming based on logical operations in 8051
10. Programming based on timers in 8051
11. Programming based on interrupts in 8051

Design based Problems (DP)/Open Ended Problem:

1. Design of digital clock using microprocessors/microcontrollers
2. Implementation of interrupt mechanism in microprocessors
3. Study of traffic controlling syasstem using microprocessors/microcontrollers
4. To study the interfacing of various sensors using microcontrollers.
5. To study and interface input/output devices with microcontrollers.
6. Wired and wireless communication using microcontrollers.

Major Equipment:

1. 8085 microprocessor and 8051 trainer kit
2. Different peripheral devices
3. CRO, power supply

List of Open Source Software/learning website:

1. 8085 simulator
2. 8051 simulator
3. nptel.ac.in
4. wikipedia.org/wiki.intel_8085
5. wikipedia.org/wiki.intel_8051

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.