GUJARAT TECHNOLOGICAL UNIVERSITY
MECHATRONICS ENGINEERING
B. E. SEMESTER: VII

Subject Name: **Microcontrollers and Embedded Systems**
Subject Code: **172001**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
3	0	2	5	70	30	30	20

Sr. No	Course Content	Total Hrs.
1.	**Overview:** Embedded Systems and microcontrollers, Microcontroller based systems, Historical perspective, von Neumann versus Harvard Architecture and CISC versus RISC Processors.	2
2.	**Interfacing real world devices with 8051 microcontroller:** Analog to Digital converters (ADC) & Digital to Analog Converter (DAC) basics. ADC, DAC and Temperature Sensor interfacing with 8051 microcontroller. LCD and Matrix Keyboard interfacing with 8051 microcontroller.	7
3.	**Motor Control: Relay, PWM, DC and Stepper Motors:** Relays and Opt-isolators, Stepper motor interfacing, DC motor interfacing and PWM with 8051.	4
4.	**8051 Programming in C:** 8051 C programming basics and time delay in 8051 C, I/O programming in 8051 C, Logic operations in 8051 C, Data conversion programs in 8051 C, Accessing code ROM space in 8051 C.	3

5.	**8051 Timer, Serial port, interrupt Programming in C:** Programming 8051 timers/Counter in C. Basics of serial communication, 8051 connection to RS232, 8051 serial port programming in C. 8051 interrupts programming in C: Timer interrupts, external hardware interrupts and serial communication interrupt.	4
6.	**Microcontroller Architecture – PIC18F Family:** Block diagram, Memory Organization.	2
7.	**PIC 18F Programming Model and Its Instruction Set:** PIC18F Family Programming model , Introduction to PIC18F Family instruction Set	3
8.	**Data transfer, Arithmetic and Branch Instructions - PIC18F Family:** Data copy operations, Arithmetic operations, branching operations, Stack and Subroutines and Illustrative Programs.	4
9.	**Logic, Bit manipulation and Multiply/Divide operations - PIC18F Family:** Logic operations,, Bit operations, Multiply/divide operations and Illustrative Programs.	4
10.	**I/O ports, Interrupts and Timers - PIC18F Family:** Basics concepts of Input/output ports and Interfacing input/output peripherals, PIC18F Interrupts, PIC18F Timers, Illustration programs.	7

List of Experiments:

1. Interfacing ADC and DAC with 8051 microcontroller.
2. Interfacing Matrix Keyboard with 8051 microcontroller.
3. Interfacing LED and LCD Displays with 8051 microcontroller.
4. Interfacing Stepper Motor with 8051 microcontroller.
5. Controlling DC motor using PWM with 8051 microcontroller.
6. Introduction to MPLAB IDE and Basic programming for PIC18F microcontroller.
7. Simulate programs based on data transfer and arithmetic operations in PIC18F microcontroller.

8. Simulate programs based on logical operations in PIC18F microcontroller.
9. Programming based on stack and subroutines in PIC18F microcontroller.
10. Interfacing Input/output Peripherals with PIC18F microcontroller.
11. Programming based on Interrupts in PIC18F microcontroller.
12. Programming based on timers in PIC18F microcontroller.

Text Books:

1. The 8051 Microcontroller and Embedded Systems Using Assembly and C, by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay (Second Edition , Pearson Education).

2. Fundamentals of Microcontrollers and Applications in Embedded Systems (with the PIC18 Microcontroller Family), by Ramesh Gaonkar, Penram.

Reference Books:

1. The 8051 Microcontroller & Embedded Systems using Assembly and C By K. J. Ayala, D. V. Gadre (Cengage Learning , India Edition).

2. 8051 Microcontroller: Internals, Instructions, Programming and Interfacing by Subrata Ghoshal, Pearson Education.

3. The 8051 Microcontrollers: Architecture, Programming and Applications by K Uma Rao, Andhe Pallavi, Pearson Education.