GUJARAT TECHNOLOGICAL UNIVERSITY
B. E. SEMESTER: V
INSTRUMENTATION AND CONTROL ENGINEERING/BIO-MEDICAL ENGINEERING/ELECTRICAL & ELECTRONICS/ELECTRONICS ENGINEERING/ELECTRONICS & COMMUNICATION ENGINEERING/ELECTRONICS & TELECOMMUNICATION ENGINEERING

Subject Name: **Microcontroller   and   Interfacing**
Subject Code: **151001**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
3	0	2	5	70	30	50

Sr. No	Course Content
1.	**8051 Microcontrollers:** Microcontrollers and embedded processors, Overview of the 8051 family
2.	**8051 Assembly Language Programming:** Architecture of 8051, Introduction to 8051 assembly programming, Assembling and running an 8051 program, The program counter and ROM space in the 8051, 8051 data types and directives, 8051 flag bits and the PSW register, 8051 register banks and stack
3.	**Jump, Loop, And Call Instructions:** Loop and jump instructions, Call instructions time delay for various 8051 chips.
4.	**I/O Port Programming:** 8051 I/O programming, I/O bit manipulation programming.
5.	**8051 Addressing Modes:** Immediate and register addressing modes, Accessing memory using various addressing modes, Bit addresses for I/O and RAM, Extra 128-byte on-chip RAM in 8052.
6.	**Arithmetic and Logic Instructions and Programs:** Arithmetic instructions, Signed number concepts and arithmetic operations, Logic and compare instructions, Rotate instruction and data serialization, BCD, ASCII, and other application programs.

7.	**8051 Programming in C:** Data types 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, Data serialization using 8051 C.
8.	**8051 Hardware Connection and Intel Hex File:** Pin description of the 8051, Design and test of 8051 Minimum Module, Explaining the Intel hex file.
9.	**8051 Timer Programming in Assembly and C:** Programming 8051 timers, Counter programming, Programming timers 0 and 1 in 8051 C.
10.	**8051 Serial Port Programming in Assembly and C:** Basics of serial communication, 8051 connection to RS232, 8051 serial port programming in Assembly, Programming the second serial port, Serial port programming in C.
11.	**Interrupts Programming in Assembly and C:** 8051 interrupts programming, Timer interrupts, Programming external hardware interrupts, Programming the serial communication interrupt, Interrupt priority in the 8051/52, Interrupt programming in C.
12.	**LCD and Keyboard Interfacing:** LCD interfacing, Keyboard interfacing.
13.	**ADC, DAC, and Sensor Interfacing:** Parallel and serial ADC, DAC interfacing, Sensor interfacing and signal conditioning.
14.	**8051 Interfacing to External Memory:** Semiconductor memory, Memory address decoding, 8031/51 interfacing with external ROM, Flash RAM, 8051 data memory space, Accessing external data memory in 8051 C.
15.	**RTC Interfacing and Programming:** RTC interfacing, RTC programming in C, Alarm, SQW, and IRQ features of the DS12887 chip.
16.	**Motor Control: Relay, PWM, DC and Stepper Motors:** Relays and Optoisolators, Stepper motor interfacing, DC motor interfacing and PWM.

List of Practical:

Assembly language programming for the 8051 Microcontroller

1. a) Write a program to add two 8-bit numbers stored in registers or internal/External memory locations.
    b) Write a program to multiply two 8-bit numbers stored in registers or internal/External memory locations.
    c) Write a program to multiply two 16-bit numbers.

2.   a) Write a program to add block of data stored in internal/external memory locations.
      b) Write a program to transfer block of data from internal memory locations to external memory locations.
      c) Write a program to sort block of data in ascending or descending order.

3.   a) Write a program to perform the following.
         1. Keep monitoring P1.2 until it becomes high.
         2. When P1.2 becomes high write value 45H on P0.
         3. Sent a high to low pulse to P2.3
      b) A switch is connected to P1.7. Write a program to check the status of switch and perform the following.
         1. if switch = 0, send letter "N" to P2
         2. if switch = 1, send letter "Y" to P2.

4.   a) Write a program to generate 5 KHz pulse waveform of 50% duty cycle on pin 1.0 using timer 1 in mode 2.
      b) Write a program to generate 1 KHz pulse waveform of 70% duty cycle on pin 1.0 using timer.

5.   a) Write a program for the 8051 to transfer letter "A" serially, continuously.
      b) Write a program to transfer the message "YES" serially. Do this continuously.
      c) Program the 8051 to receive bytes of data serially, and put them in P1.

Microcontroller Interfacing

6.   Interfacing ADC and DAC.

7.   Interfacing Matrix Keyboard.

8.   Interfacing LED and LCD Displays.

9.   Interfacing Stepper Motor.

10.   Controlling DC motor using PWM.

Miniproject based on 8051 family microcontroller in a group of 2 to 3 students is mandatory.

Practical number 1 to 5 is programmed in assembly language as well as in embedded C.

References Books:

1. The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2/e by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay (Second Edition , Pearson Education).
2. The 8051 Microcontroller & Embedded Systems using Assembly and C By K. J. Ayala, D. V. Gadre (Cengage Learning , India Edition).
3. 8051 Microcontrollers: MCS51 family and its variants by Satish Shah, Oxford University Press.

4. 8051 Microcontroller: Internals, Instructions, Programming and Interfacing by Subrata Ghoshal, Pearson Education.
5. The 8051 Microcontrollers: Architecture, Programming and Applications by K Uma Rao, Andhe Pallavi, Pearson Education.