

# GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: VI

Electrical Engineering

Subject Name: **Microcontroller**

<b>Sr. No</b>	<b>Course Content</b>	<b>Total Hrs.</b>
1.	<b>Introduction to 8051 Microcontroller:-</b> Introduction, Difference between Microprocessors and Microcontrollers. Overview of 8051 Microcontroller family, Introduction to different microcontroller families ( PIC,AVR,ARM)	3
2.	<b>Architecture of 8051 Microcontroller:-</b> Introduction, 8051 microcontroller hardware, Pin diagram of 8051, input/output pins, ports and circuits. Internal RAM and ROM , SFR's, interfacing with external memory, timers and counters, interrupts.. Serial data communication (UART).	10
3.	<b>Introduction to Program development tool Chain using <math>\mu</math>VISION3:</b> Integrated development Environment (IDE), editor-assembler, compiler, linker, simulator, and debugger. Assembly and 'C' program development and debugging process.	3
4.	<b>8051 Assembly language programming :-</b> Addressing modes, data transfer instructions, Logical instructions, Arithmetic instructions, Branching (Jump & Call ) instructions, Bit addressable instructions and special instructions, Interrupts and interrupt handler sub routines ( Interrupt Service Routines).	8
5.	<b>8051 programming in embedded C :-</b> Introduction, Date types in embedded C, arithmetic and logical operators, Control statements and loops in embedded C, Functions and Arrays in embedded C. Programming of input/ output ports, Programming of Timer & counters, writing interrupt service routines in Embedded C, Programming of UART and PCA Timer in embedded C.	10
6.	<b>Hardware Interface:-</b> Introduction, Interfacing and C programming of 8051 with keyboard, Interfacing and C programming of 8051 with 7-segment display, Interfacing and C programming of 8051 with LCD display, Interfacing and C programming of 8051 with ADC-DAC and sensors, SPI and I <sup>2</sup> C serial communication protocols and their programming.	8

7.	<b>Applications and design of microcontroller based systems::-</b> Relay and optoisolators, stepper motor control, SCR firing circuit, DC motor interfacing and PWM..	4
8.	<b>Advancements in 8051 architecture :</b> Infineon - XC88X, SiLabs- C8051F12X(CIP 51 core)	2

### Suggested List of experiments:-

1. Introduction to assembler directives.
2. Assembly language programming for addition, subtraction, multiplication and division of two 8-bit numbers.
3. Assembly language programming for block data transfer between internal and external memory including overlapping blocks.
4. Assembly language programming for Timers in different modes.
5. Introduction to  $\mu$ VISION3 IDE , program development and debugging (simulation) process.
6. I/O port programming in embedded C.
7. Timers and Counters programming in embedded C for time delay and frequency measurement using ISRs.
8. Digital clock programming using 7- segment display in embedded C.
9. Programming of LCD in embedded C.
10. Programming of keyboard in embedded C.
11. Serial communication and UART programming in Embedded C.
12. Programming of parallel ADC and DAC in embedded C.
13. SPI programming in embedded C.

### Text Books:

1. The 8051 Microcontroller Architecture, Programming & Applications by- Kenneth J. Ayala(Penram International)
2. The 8051 Microcontroller and embedded systems using Assemble and C. by – Muhammad Ali Mazidi and Janice Gillipse Mazidi ( Pearson Education)

### References Books:

1. The 8051 Microcontroller & Embedded systems using Assembly and C. by – K.J. Ayala, D.V. Gadre ( Cengage Learning, India Edition)
2. Embedded C programming and Microchip PIC by- Barnett, O'cull and Cox Cengage Learning.
3. Programming and Customizing the 8051 Microcontroller by Myke Predko Tata Mcggraw Hill.
4. 8051 Microcontrollers: MCS51 family and its variants by Satish Shah, Oxford University Press.
5. [www.infineon.com](http://www.infineon.com) [www.silabs.com](http://www.silabs.com)