

## Core-IV

## Microcontroller Programming and Applications

### Course Outcomes (COs):

- Understand the architecture of microprocessor, microcontroller, and fundamental operating concepts.
- Learn the design aspects of interfacing circuits and communication techniques
- Demonstrate programming proficiency using the various addressing modes and design microcontroller based solutions to problems.

### Unit-1

- Fundamentals of Microprocessor:
- Compare microprocessor and microcontroller, Architecture of 8085 microprocessor, Pin details and functional operation of 8085, Memory and I/O interfacing, Basics of Programming.

### Unit-2

- Introduction to 8051 Architecture : The 8051 Architecture- Hardware- Oscillator and clock-
- program counter –data pointer-registers-stack and stack pointer-special function registers- memory organization-program memory-data memory -Input / Output Ports –External memory counter and timer-serial data Input / output-Interrupts.

### Unit-3

- 8051 Programming in Assembly Language : Basics of 8051 Assembly Language Programming-
- Structure of Assembly language-Assembling and running an 8051 program- Moving Data, Different Addressing modes-Accessing memory using various addressing modes- Arithmetic operations and Programs-Logical operations and Programs - Branching - I/O Port Programs – bit level instructions and Programs –Timer and counters - and application Programs, Interrupt programming, 8051 programming in ‘C’.

### Unit-4

- Peripheral Interfacing: Memory Interfacing, 7-Segment LED Display, LCD and Keyboard
- Interfacing, ADC, DAC interfacing, relay, Stepper Motor Interfacing, DC motor control, different
- Sensors and relevant application programs.

### Suggested References:

- ✓ *Microprocessor Architecture: Programming and Applications with the 8085*, Penram International Publishing by R. S. Gaonkar.
- ✓ *The 8051 Microcontrollers Architecture, Programming & Applications* by Kenneth J. Ayala.

- ✓ *The 8051 Microcontrollers and Embedded Systems by Muhammed Ali Mazidi.*
- ✓ *Embedded Systems, Shibu K, Tata McGraw Hill Publishing, New Delhi.*
- ✓ *Programming and Customizing the 8051 Microcontroller, Myke Predko, Tata McGraw-Hill Edition.*

**Practical:**

1. Use 8051 Simulation tool
2. Test and verify the features of 8051 Trainer Kit
3. Write and execute assembly language programs based on Data transfer Instructions
4. Develop assembly language programs based on Arithmetic Instructions (e.g. 8 bit Addition , Subtraction, Multiplication, Division)
5. Develop Assembly Language Programs based on Logical Instructions (And, Or etc.)
6. Develop Assembly Language Programs based on Branch Instructions
7. Develop Assembly Language Programs based on Looping, Counting and Indexing concept
8. Develop Assembly Language Programs to introduce delay (e.g.1ms Delay) using Timer/Counter
9. Develop Assembly Language Programs for Interrupts
10. Develop Programs for serial communication
11. Develop a program to interface LED with 8051
12. Develop a program to interface 7 segment Display with 8051
13. Develop a program to Interface 8 bit DAC with 8051
14. Develop a program to interface a DC Motor with 8051
15. Develop a program to interface LCD Module with 8
16. Develop a 4 bit binary counter with 8051 and display out put on LCD
17. Develop a program to interface a Stepper Motor with 8051
18. Develop a data acquisition system using ADC0804 and Microcontroller