Semester	IV	Course Title	Microcontroller	Course Code	18 EC 42
Teaching Period	50 Hours	L – T – P – TL*	3 – 1 – 0 – 4	Credits	4
CIE*	40 Marks	SEE*	60 Marks	Total	100 Marks

CREDITS – 04

Course Learning Objectives: This course will enable students to:

- Familiarize the difference between a Microprocessor and a Microcontroller and embedded microcontrollers and basic architecture of 8051 microcontroller.
- Program 8051microcontroller using Assembly Level Language.
- Understand the Stack and interrupt of 8051 and the use of interrupts.
- Understand the operation and use of inbuilt Timers/Counters and Serial port of 8051.
- Basics of 8086 and its system bus configurations.

Module -1

8051 Microcontroller: Microprocessor Vs Microcontroller, Embedded Systems, Embedded Microcontrollers, 8051 Architecture- Registers, Pin diagram, I/O ports functions, Assembler Directives, Internal Memory organization. External Memory (ROM & RAM) interfacing. **L1, L2, L4**

Module -2

Module -2
8051 Instruction Set: Addressing Modes, Data Transfer instructions, Arithmetic instruction Logical instructions, Branch instructions, Bit manipulation instructions, Subroutine instruction Simple Assembly language program examples (without loops) to use these instructions.**L1, L2, L3**

Module -3

tack and Interrupts:
Stack Operation, Basics of Interrupt, Interrupt Vector Table, Level Triggered Interrupt, Edge Triggere Interrupt, Interrupt Priority. **L1, L2, L3**

Timers:
Basics of Timers, Operation and Programming of Timers in Mode 0 and 1, Time Delay Generatio Simple Assembly Language programming of 8051 timers Delay calculations. **L1, L2, L3**

Module -4

8051 Serial Communication: 8051 Serial Communication: Basics of Serial Data Communication, connections to RS-232, Simple Serial communication Programming to transmit a message and to receive data serially in assembly and C. **L1, L2, L3**

8255A Programmable Peripheral Interface: Block Diagram of 8255A, I/O addressing, Control Word Format of 8255, 8255 Interfacing. **L1, L2, L4**

Module 5

Basics of 8086 Microprocessor:
Architecture of 8087, 8088 Microprocessor Vs 8086Microprocessor, Von-Neumann & Harvard CPU architecture, CISC and RISC CPU architecture. INT 21h DOS Function Call - for handling Keyboard and Display (Reference Book 3).   **L1, L2**

8086 Bus Configuration and Timings: General Bus operation cycle, Minimum mode 8086
system and Timing diagrams, Maximum Mode 8086 system and Timing diagrams.   **L1, L2, L3**

Course outcomes: At the end of the course, students will be able to:

- Design and Interface External memory to 8051 and to study the History, evaluation of Microprocessors Vs Microcontroller, Architecture, Registers, I/O Ports, Assembler Directives,
- Analyze addressing modes and 8051 Assembly level programs using the 8051 instruction set.
- Classify stacks, interrupts, timers, counters and their I/O port interface programming using assembly languages.
- Categorizing serial communication, 8255 Programmable peripherals Interface operations, and Serial Communication programming using assembly and C language.
- Explain the basics of 8086 Microprocessors, Architecture of 8087, Difference between 8088, 8086, von-Neumann, harvard, DOS function call and 8086 Timing, bus configuration to operate in different modes.

Text Book:

- **"The 8051 Microcontroller and Embedded Systems** – using assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.

- "**The 8051 Microcontroller**", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.

Reference Books:

- **"The 8051 Microcontroller Based Embedded Systems"**, Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.

- **"Microcontrollers**: **Architecture, Programming, Interfacing and System Design"**, Raj Kamal, Pearson Education, 2005.

- **The Intel Microprocessor, Architecture, Programming and Interfacing** - Barry B. Brey, 6e, Pearson Education / PHI, 2003.