8051 MICROCONTROLLER
B.E., V Semester (Open Elective)
[As per Choice Based Credit System (CBCS) Scheme]

Course Code	17EC563	CIE Marks	40
Number of Lecture Hours/Week	03	SEE Marks	60
Total Number of Lecture Hours	40 (08 Hrs/ Module)	Exam Hours	03

CREDITS – 03

Course objectives: This course will enable students to:
- Understand the difference between a Microprocessor and a Microcontroller and embedded microcontrollers.
- Familiarize the basic architecture of 8051 microcontroller.
- Program 8051microprocessor using Assembly Level Language and C.
- Understand the interrupt system of 8051 and the use of interrupts.
- Understand the operation and use of inbuilt Timers/Counters and Serial port of 8051.
- Interface 8051 to external memory and I/O devices using its I/O ports.

Module -1

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

Module -2

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

Module -3

8051 Stack, I/O Port Interfacing and Programming: 8051 Stack, Stack and Subroutine instructions. Assembly language program examples on subroutine and involving loops - Delay subroutine, Factorial of an 8 bit number (result maximum 8 bit), Block move without overlap, Addition of N 8 bit numbers, Picking smallest/largest of N 8 bit numbers.
Interfacing simple switch and LED to I/O ports to switch on/off LED with respect to switch status. **L1, L2, L3**

Module -4

8051 Timers and Serial Port: 8051 Timers and Counters – Operation and Assembly language programming to generate a pulse using Mode-1 and a square wave using Mode-2 on a port pin.
8051 Serial Communication- Basics of Serial Data Communication, RS-232 standard, 9 pin RS232 signals, Simple Serial Port programming in Assembly and C to transmit a message and to receive data serially. **L1, L2, L3**

Module -5

8051 Interrupts and Interfacing Applications: 8051 Interrupts. 8051 Assembly language programming to generate an external interrupt using a

switch, 8051 C programming to generate a square waveform on a port pin using a Timer interrupt.

Interfacing 8051 to ADC-0804, LCD and Stepper motor and their 8051 Assembly language interfacing programming. **L1, L2, L3**

Evaluation of CIE Marks:

It is suggested that at least a few simple programs to be executed by students using a simulation software or an 8051 microcontroller kit for better understanding of the course. This activity can be considered for the evaluation of 10 marks out of 40 CIE (Continuous Internal Evaluation) marks, reserved for the other activities.

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

- Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 Microcontroller, Interfacing of 8051 to external memory and Instruction set of 8051.
- Write 8051 Assembly level programs using 8051 instruction set.
- Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051.
- Write 8051 Assembly language program to generate timings and waveforms using 8051 timers, to send & receive serial data using 8051 serial port and to generate an external interrupt using a switch.
- Write 8051 C programs to generate square wave on 8051 I/O port pin using interrupt and to send & receive serial data using 8051 serial port.
- Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 using 8051 I/O ports.

TEXT BOOKS:
1. **"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.

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

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

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

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