8051 MICROCONTROLLER

B.E., V Semester (Open Elective)

[As per Choice Based Credit System (CBCS) scheme]

Subject Code	15EC563	IA Marks	20
Number of Lecture Hours/Week	03	Exam Marks	80
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 AssemblyLevel 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	**RBT Level**
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	L1, L2, L3

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.	
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 Internal Assessment 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 5 marks out of 20 Internal assessment 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.	
Question paper pattern: • The question paper will have ten questions. • Each full Question consisting of 16 marks • There will be 2 full questions (with a maximum of Three sub questions) from each module. • Each full question will have sub questions covering all the topics under a module. • The students will have to answer 5 full questions, selecting one full question from each module.	

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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