

COURSE TITLE	MICROCONTROLLER & EMBEDDED SYSTEMS
COURSE CODE	01EE1602
COURSE CREDITS	4

Objective:

- 1 The course is intended to impart skills related to development of embedded system for application specific to Electrical Engineering and related domains.

Course Outcomes: After completion of this course, student will be able to:

- 1 Describe the architecture and pin diagram of MCS-51 microcontroller.
- 2 Develop assembly language and C program for microcontroller-based system.
- 3 Determine configuration of microcontroller for application of timer/serial comm or interrupt in given application.
- 4 Design appropriate interface for microcontroller in a given application.

Pre-requisite of course: Analog and Digital Electronics

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Introduction to Microcomputer systems Digital Computer, Microprocessor, Microcontroller, Van Neumann, and Harvard Architecture, CISC and RISC Processors, Revision of hex code, decimal code and BCD code	2
2	8051 Microcontroller architecture Specifications of MCS -51 Family Micro-controllers, Architectural block Diagram, Pin diagram and Pin Functions, General Purpose and Special Function Registers, Oscillator and clock circuit, Reset circuit, I/O Port circuits, Memory organization	6
3	8051 Assembly language programming Programming model of 8051, Addressing modes, programming of 8051 based on data transfer, arithmetic, and logical group, branching instructions, bit manipulation instructions and I/O Port programming, Concept of stack, subroutine and related instructions, writing programs for generating time delay, code conversions in assembly language of 8051, Reading lookup table	6

Contents : Unit	Topics	Contact Hours
4	8051 Programming in C Data types in 8051 C, programming for time delay, I/O programming in 8051 C, Logic operations in 8051 C, Control statements and loops in embedded C, Functions and Arrays in embedded C, Data conversion programs in 8051 C, accessing code ROM space using 8051 C	6
5	8051 Timer/Counter and Programming Operation of timer in 8051, Timer/Counters and associated registers, Various modes of timer/counter operations, Time delay programs in Assembly language/ Embedded C	4
6	8051 Serial Port and Programming Basics of serial communication, RS232 standards, 8051 connections to RS232, Serial data input/output and associated registers, Various modes of serial data communication, serial data communication programs in Assembly language/ Embedded C, SPI protocol, I2C Protocol	5
7	8051 Interrupts Concept of Interrupt, interrupt versus polling, Types of interrupts in 8051, Reset, interrupt control and associated registers, interrupt vectors, Interrupt execution, RETI instruction, software-generated interrupt, interrupt handler subroutine for timer/counter and serial data transmission/reception in Assembly language/ Embedded C	2
8	Applications and design of microcontroller-based systems Interfacing of LEDs, 7 Segment display device, DIP Switches, Push Button switches, Key denounce techniques, LCD display, Keyboard connections load per key and matrix form, Interfacing A/D converter, D/A converter, Relay, optoisolator stepper motor PWM programming and DC motor control	11
Total Hours		42

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Experiment-1 Introduction to Integrated Development Environment	2
2	Experiment-2 Interfacing of LED with 8051 Microcontroller	2
3	Experiment-3 Interfacing of 7-segment display with 8051 using C	2
4	Experiment-4 Interfacing of stepper motor with 8051 using C	2
5	Experiment-5 Interfacing of Push-button switch and Relay with 8051 microcontrollers	2

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
6	Experiment-6 Interfacing of Digital to Analog Converter with 8051 microcontroller using C	2
7	Experiment-7 Interfacing of Analog to Digital Converter with 8051 microcontroller using C	2
8	Experiment-8 To learn serial communication of 8051 microcontroller using C	2
9	Experiment-9 To learn Programming of Timers of 8051 microcontroller using C	2
10	Experiment-10 Interfacing LCD display with 8051 microcontroller using C	2
11	Experiment-11 Assembly Language Programming of 8051 microcontroller - Arithmetic and Logical Instructions, Assembly Language Programming of 8051 microcontroller - Branching and Looping instructions, Assembly Language Programming of 8051 microcontroller - Special Programs	4
12	Experiment-12 Use of Wjung toolbox for programming of STM 32 microcontroller.	2
Total Hours		26

Textbook :

- 1 The 8051 microcontroller and embedded systems: using Assembly and C, Mazidi MA, Mazidi JG, McKinlay RD, Pearson/Prentice Hall, 2006
- 2 The 8051 microcontroller: Architecture, programming, and applications, Ayala KJ, Cengage Learning India, 2007
- 3 8051 Microcontroller: Internals, Instructions, Programming & Interfacing, Subrata G, Pearson Education India, 2010
- 4 8051 Microcontroller Hardware, Software & Applications, V. Udayashankara, M. S. Mallikarjunaswamy, McGraw-Hill Education (India) Pvt Limited, 2009

References:

- 1 8051 Microcontroller: An Applications Based Introduction, 8051 Microcontroller: An Applications Based Introduction, Calcutt D, Cowan F, Parchizadeh H, Elsevier, 2003

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	20.00	20.00	25.00	15.00	10.00

Instructional Method:

- 1 Students should make a project as part of group. Student may take project out of given list but not restricted to, 1. Room Temperature Indicator and controller 2. Battery voltage logging system 3. GSM based Security Application 4. RPM Meter/ power meter/power factor meter/ over current relay/ under-over voltage relay 5. Applications based on RTC DS1307

Supplementary Resources:

- 1 <https://nptel.ac.in/courses/117/104/117104072/>
- 2 www.academia.edu