

EE303: MICROCONTROLLER AND APPLICATIONS
CREDITS = 5 (L=3, T=0, P=2)

Course Objectives:

1. to provide solid foundation on interfacing the external devices to the processor according to the user requirements.
2. To create novel products and solutions for the real time problems.
3. To assist the students with an academic environment aware of excellence guidelines and lifelong learning needed for a successful professional career.

Teaching and Assessment Scheme:

Teaching Scheme			Credits	Assessment Scheme				
L	T	P	C	Theory		Practical		Total Marks
				ESE	CE	ESE	CE	
3	0	2	5	70	30	30	20	150

Course Contents:

Unit No.	Topics	Teaching Hours
1	<p><u>Microcontroller Basics:</u></p> <p>8-Bit Microcontroller Block Diagram, CPU, ALU, address bus, data bus, control signals, Clock and Reset circuits, Working Registers, SFRs, Stack and use of Stack Pointer, Program Counter, I/O Ports, Memory organization, Data Memory, Program Memory, and Execution of Program. Power saving modes and its operation. Timing Diagram: Timing diagram for execution cycle, Oscillator and clock circuit, Reset circuit, I/O Port circuits, Different Addressing Modes.</p>	06
2	<p><u>8051 Microcontroller Architecture:</u></p> <p>Introduction to MCS -51 Family microcontrollers, Architectural block Diagram, Pin diagram and Pin Functions, General Purpose and Special Function Registers, Memory organization, Internal program and data memory.</p>	04

Unit No.	Topics	Teaching Hours
3	<u>On Chip Peripherals:</u>	
	Concept of Interrupt, Interrupt versus polling, Types of Interrupts in 8051, Interrupt control and associated registers, Interrupt vectors, Interrupt execution, Basics of serial communication, Serial data input/output and associated registers, Various modes of serial data communication, Timer/Counters and associated registers, Various modes of timer/counter operations.	05
4	<u>Integrated Development Environment (IDE) for Microcontrollers:</u>	
	Integrated Development Environment (IDE) for Microcontroller, programming using assembly and C language, programming tools such as simulator, assembler, "C" cross compiler, emulator and debugger. Illustrative applications and programming techniques, Programming using: Arithmetic instructions, Logic instructions, Single bit instructions, Jump, Loop and Call instructions, I/O programming, , Timer/Counter Programming, UART programming, Interrupt Programming.	08
5	<u>On Chip Peripheral Interfaces:</u>	
	Interfacing concept, Interfacing of digital input and output pin, PWM, ADC, I/O Pins, Timers, counters, Interrupts, UART, I2C, SPI, ICSP, DATA EEPROM, FLASH memory.	07
6	<u>External Peripheral Interfaces:</u>	
	A to D, D to A, LCD, LED & keyboard interfacing, External Memory Interfacing, Stepper motor interfacing, DC Motor interfacing, sensor interfacing, Introduction to CAN Protocol and its interfacing, USB protocol and its interfacing, Blue-tooth, Zig-bee protocol and its interfacing.	07
7	<u>Introduction to Advanced Microcontrollers:</u>	
	Advanced concepts of 8-bit controllers, study of watchdog timer, study of PCA timer in different modes like capture mode, PWM generation mode, High speed output, toggle mode, migrating from 8- bit to 16- bit and 32 bit ARM Processors.	05
8	<u>Application of Microcontrollers:</u>	
	Application of Microcontroller in Day to Day Life Devices(Domestic appliances), Industrial Control Devices, Metering & Measurement Devices, Energy Management and Automobiles.	05
TOTAL		47

List of References:

1. Muhammad A. Mazidi, "The 8051 Microcontroller: A System Approach, 1st Ed., PHI, 2012.
2. Kenneth J. Ayala ,8051 Microcontroller, 3rd Ed., Cengage Learning Publication, 2004
3. Datasheet of P89V51RD2.
4. MykePredko, Programming and Customizing the 8051 Microcontroller, Tata McGraw Hill, 1999.
5. Han Way Huang, Using the MCS-51 Microcontrollers, Oxford Uni Press.
6. Shibu K. V, Introduction to Embedded Systems, Tata McGraw Hill, 2009.

Web Resources:

<http://nptel.iitm.ac.in/courses/Webcoursecontents/IITKANPUR/microcontrollers/micro/ui/TOC.html>

Course Outcomes (Cos):

At the end of this course students will be able to:

- CO1: Express the limitations and strengths of different types of microcontrollers and their comparison.
- CO2: Understand the internal design of 8051 microcontroller along with the features and their programming.
- CO3: Design different interfacing applications and implement for experimentation.
- CO4: Prepare the technical documentation for the activities done.
- CO5: Build and experiment with microcontrollers for simple applications.
- CO6: Design, implement and test a single-processor embedded systems for real-time applications.