

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Microcontroller and Applications
Course Code:	1ET1090503
Pre-requisite Course:	Digital Electronics, Analog Electronics, Microprocessor

Course Objectives:

1. The objective of the course is to expose to the students to the architecture and instruction set of 8-bit microcontroller.
2. It also deals with Assembly Language Programming and Embedded C Programming using Keil vision Software.
3. Input-output techniques, programming of important programmable support chips as well as different external hardware's used in microcontroller-based systems are discussed in detail.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	-	2	4	28	70	12	30	12	30	08	20	150

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	8051 Microcontroller Architecture: Introduction to 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, Internal program and data memory.	06	15
2	8051 Assembly language programming: Programming model of 8051, Addressing modes, data transfer instructions, I/O Port programming, Arithmetic and Logical instructions, bit level instructions, branching instructions, Concept of stack, subroutine and related instructions, writing programs in assembly language 8051 and testing the same using IDE.	08	20
3	8051 Programming in C: Data types, programming for time delay, I/O programming in 8051 C, Logical operations, Control statements and loops, Functions, pointers and Arrays, Data conversion programs, Accessing code ROM space using 8051 C, Data serialization using 8051 C.	08	20

4	External Memory Interfacing: Memory address decoding, interfacing 8031/8051 with ROM/EPROM and Data ROM.	03	07
5	8051 Timer/Counter and Programming: Use of counter as timer, Timer/Counters and associated registers, Various modes of timer/counter operations, Time delay programs in Assembly language/ Embedded C.	03	08
6	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 and Embedded C.	04	10
7	Interfacing and Programming of 8051 with External Hardware: Interfacing of LEDs, 7 Segment display device, LCD display, DIP Switches, Push Button switches, Key denounce techniques, Keyboard connections load per key and matrix form, Interfacing A/D converter, D/A converter, Relay, opto isolator stepper motor and DC motor.	10	20

Reference Books:

1. The 8051 Microcontroller & Embedded Systems using Assembly and C By K.J.Ayala, D.V.Gadre (Cengage Learning, India Edition), 2007.
2. The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2nd edition by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay (Second Edition, Pearson Education, 2003).
3. Using the MCS-51 Microcontrollers by Han Way Huang, Oxford Uni Press, 2013.
4. Programming and Customizing the 8051 Microcontroller by Myke Predko, Tata Mcgraw Hill, 2006.

List of Experiments:

1. Introduction to IDE and Assembler directives.
2. 8051 Assembly language programming for addition, subtraction, multiplication and division of two 8-bit numbers.
5. 8051 Assembly language programming for block data transfer between internal and external memory including overlapping blocks.
4. 8051 Assembly language programming using Arithmetic instructions
5. 8051 Assembly language programming using Logical Instructions
6. 8051 Assembly language programming for code conversions
7. 8051 Assembly language programming for Timers in different modes
8. I/O port programming in embedded C
9. Timers and Counters programming in embedded C for time delay and frequency measurement using ISRs.
10. Digital clock programming using 7- segment display in embedded C.
11. Programming of LCD in embedded C.
12. Programming of keyboard in embedded C.
13. Serial communication and UART programming in Embedded C.

14. Programming of parallel ADC and DAC in embedded C.
15. Interfacing Stepper Motor.
16. Speed Control of DC motor using PWM Technique and Microcontroller.

List of Open Source Software/learning website:

1. NPTEL (www.nptel.ac.in)
2. Kiel vision IDE (<http://www.keil.com/dd/chip/2976.htm>)

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Apply the concept of buses, microcontroller architecture and interrupts.	3 Applying
CLO2	Program assembly language programming/ C programming of 8051.	3 Applying 4 Analyze
CLO3	Interface memory and I/O devices with 8-bit microcontroller.	4 Analyze
CLO4	Design microcontroller based small system	5 Evaluate
CLO5	Analyze Basics of serial communication.	4 Analyze
CLO6	Identify Concept of Interrupt.	1 Remembering

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	L					M		L			L		L	L		
CLO2			M	L			L		M	L		L			L	
CLO3		H			M	L										L
CLO4	L			M			M		H		L			M	L	
CLO5			L			L									L	
CLO6		M			L			M		M		M	L			L

H: High, M: Medium, L: Low