DAYANANDA SAGAR COLLEGE OF ENGINEERING
(An Autonomous Institute Affiliated to VTU, Belagavi) Approved by AICTE & ISO 9001:2008 Certified)
Accredited by National Assessment Accreditation Council (NAAC) with 'A' grade
Shavige Malleshwara Hills, Kumaraswamy Layout, Bengaluru-560078
DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING
2021 SCHEME & SYLLABUS

Microcontrollers

Course code: 21EE43   **Credits: 03**

L: T: P:S:: 3:0:2:0   **CIE Marks: 50**

Exam Hours: 03   **SEE Marks: 50**

Course Objectives:

1. To provide familiarity to microcontroller architecture, memory and I/O ports and assembly and C language programming.

2. Demonstrate the usage of instruction set, timers and counters of 8051microcontroller to carry out programming in both polling and interrupt driven environments.

3. To provide the knowledge about the microcontroller interfacing with common peripheral devices.

Course Outcomes:
At the end of the course, student will be able to:

CO1	Apply the knowledge to identify the various features of 8051 controller.
CO2	Analyze problems and illustrate various solutions using 8051 controller.
CO3	Evaluate various requirements for solving a problem and determine suitable solutions using 8051 controller.
CO4	Create an embedded system to solve practical problem.

Mapping of Course outcomes to Program outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	-	-	-	-	-	-	-	-	-	-
CO2	3	2	1	1	2	-	-	-	-	-	-	-	-	1	-
CO3	3	3	2	2	2	-	-	-	-	-	-	-	-	2	-
CO4	3	2	1	1	2	-	-	-	-	-	-	-	-	2	-

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Microcontroller Theory Syllabus:

Module	Contents of the Module	Hours	COs
1	**8051 MICROCONTROLLER ARCHITECTURE:** Introduction to Microcontrollers, CPU Architectures: RISC & CISC, Harvard & Von-Neumann, Big Endian and Little Endian, 8051 architecture, pin diagram and memory organization, external memory interface.	08	1
2	**8051 INSTRUCTION SET & ASSEMBLY PROGRAMMING:** Addressing Modes, Instruction set: Instruction timings, 8051 instructions: Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, and Bit manipulation instruction, assembly language programs using these instruction sets.	08	1
3	**EMBEDDED C PROGRAMMING & TIMER OPERATION:** Introduction to Embedded C programming, data types, basic embedded C programs, Timer register functionality, Time delay calculation, Counter operation, programming of timer/counter using assembly language programs.	08	1,2,3
4	**INTERRUPT PROGRAMMING & SERIAL COMMUNICATION WITH 8051:** Definition of an interrupt, types of interrupts, Timers and Counter programming with interrupts using assembly language program. 8051 Serial Communication: Data communication, Basics of Serial Data Communication, 8051 Serial Communication, Serial Communication interrupts,	08	1,2,3
5	**EMBEDDED SYSTEM DESIGN WITH 8051:** Basics of I/O concepts, I/O Port Operation. Interfacing of 8051 to parallel and serial ADC, DAC, Stepper Motor, DC Motor and key board.	08	1,2,3,4

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Microcontroller Laboratory Syllabus:

Sl No	Program	COs
1	a. Assembly language program in 8051 to sort the numbers stored in locations 50h to 60h.	1
	b. Assembly language program to find the largest number in a given set of numbers.	1
2	a. Embedded C program to generate Square wave using logical analyzer in KEIL.	2
	b. Embedded C program to generate Sine wave using logical analyzer in KEIL.	2
3	a. Assembly language and Embedded C program to make an LED connected to pin 1.0 blink every second.	2
	b. Assembly and Embedded C program to make and LED connected to pin 1.0 exactly 4 times, and wait for 5 seconds .	2
4	a. LEDs, LED1, LED2, LED3, LED4 are connected to pins of a port. Make the 4 LEDs blink in the following pattern LED1,LED2 -OFF, LED3,LED4 -ON => 2 Seconds LED3,LED4 -OFF, LED1,LED2 -ON => 2 Seconds Repeat the above sequence infinitely. Implement using Assembly and C programming.	2
	b. LEDs, LED1, LED2, LED3, LED4 are connected to pins of a port. Make the 4 LEDs blink in the following pattern LED1, LED2, LED3, LED4 -OFF LED1, LED2, ED3 - OFF, LED4 - ON => 2 Seconds LED1, LED2 - OFF, LED3, LED4 - ON => 2 Seconds LED1 - OFF, LED2, LED3, LED4 - ON => 2 Seconds LED1, LED2, LED3, LED4 - ON => 2 Seconds Implement using Assembly and C programming.	2
	c. LEDs, LED1, LED2, LED3, LED4 are connected to pins of a port. Make the LEDs count up/down in binary.	2
5	a. Make an LED connected to port pin blink with one second delay as long as the switch connected to another port pin is pressed. Implement using Assembly and C programming.	3,4

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		b. LEDs, LED1 and LED2 are connected to two pins of a port. A push button is used to control the blinking pattern generated using the LEDs. When the push button is not pressed. LED1→ON for 1 Second LED2→OFF for 1 second. LED2→ON for 1 Second LED1→OFF for 1 second. When the push button is pressed. LED1, LED2→ON for 2 seconds LED1, LED2→OFF for 1 second. Implement using Assembly and C Programming.	3,4
6		a. LEDs, LED1 and LED2 are connected to two port pins. Make the LED1 blink at a rate of 1 second and the LED2 at the rate of 2 seconds.	3,4
		b. LEDs, LED1 and LED2 are connected to two port pins. The LED1 blinks at a rate of 2 seconds. The LED2 blinks for 4 times on press of a push button.	3,4
		Exercise Program c. Four LEDs, LED1, LED2, LED3, LED4 are connected to 8051 port pins. A switch is provided for controlling the blinking of LEDs 3 and 4. LED1 blinks at the rate of 1 second, LED2 blinks at rate of 2.5 seconds, one switch SW1 when pressed makes LED3 to change its state and when switch SW2 is pressed LED3 changes state.	3,4
7		a. Assembly language program and Embedded C program to generate Decade UP counter on a 7 segment display.	3,4
		b. Assembly language program and Embedded C program to generate Decade UP counter on a 7 segment display at two different speeds using a switch connected to port pin. If switch is pressed, display changes at an interval of 1 second or else at an interval of 2 seconds.	3,4
		Exercise Program c. Write an Embedded C program to continuously count from 1-8 and stop the count on press of a switch, the count should stop at the count being displayed on the 7 segment.	3,4
8		a. Interface an LCD to 8051 and write an Embedded C program to display the message "Hello world".	3,4
		b. Embedded C program to display a scrolling message "Hello World" on LCD.	3,4
		Exercise Program c. Write a program in Embedded C to control the display of messages on the LCD Screen using two buttons in the following pattern. No Button Pressed : Press 1 for Yes, 2 for No Button 1 Pressed : "Yes" Button 2 Pressed : "No" Both are Pressed: "Invalid Entry" Additional Feature: Add a toggle switch which can be used to enable/disable scrolling of the message on the LCD screen.	3,4
9		Implement operation of an elevator using LEDs to indicate movement of lift and LCD to display relevant messages.	3,4

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Text Books:
1.   Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinley, "The 8051 Microcontroller and Embedded Systems – using assembly and C"-, PHI, 2006 / Pearson, 2006.
2.   Kenneth J. Ayala 2e, "The 8051 Microcontroller Architecture, Programming & Applications", Penram International, 1996 / Thomson Learning 2005.
3.   Frank Vahid, Tony D. Givargis, "Embedded System Design: A Unified Hardware/Software Introduction", Wiley publications, 2009.
Reference Books:
1.   V. Udayashankar and Malikarjuna Swamy, "The 8051 Microcontroller", TMH, 2009.
2.   K.V. Shibu, "Introduction to Embedded Systems", Tata McGraw, 2009.
3.   Rajkamal, "Embedded System Architecture: Programming & Design", TMH, 2010.

Assessment Pattern:

CIE –Continuous Internal Evaluation Theory (50 Marks)

Bloom's Category	Tests	Assignments	AAT1	AAT2
Marks (Out of 50)	**30**	**10**	**05**	**05**
Remember	10			01
Understand	10	05	01	01
Apply	10	05	02	01
Analyze			02	
Evaluate				
Create				02

SEE –Semester End Examination Theory (50 Marks)

Bloom's Category	Marks Theory(50)
Remember	10
Understand	20
Apply	10
Analyze	10
Evaluate	
Create	