SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Bachelor of Technology

B.Tech. Semester V

Subject Name: Microprocessor and Microcontroller **Subject Code:BTEL13501**

Type of course: Professional Core Course (PCC)

Prerequisite: Analog and Digital Electronics, Basic knowledge of 'C' Programming

Rationale: Microprocessors and microcontrollers are the most useful electronic chips which are used to design and develop processor and computer based automatic smart electronics systems for home and industry application. This subject is devoted to the study of microprocessor and microcontroller architecture, interfacing of memory and I/O devices like ADC, DAC, LED, LCD etc. The students learn programming languages (assembly and Embedded C) used for microcontrollers. They learn the basics of Microprocessor and designs of Microcontroller based systems and also get a brief idea of advanced microcontrollers used in industries.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
4	0	2	6	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course.

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage %
1.	**Microprocessor Based Systems:** Review of logic devices: Latches, Flip flops, Buffers, Decoders, Types of Memory; Digital Computer, Microprocessor, Microcontroller, Comparison of microprocessor and Microcontroller, Van Neumann and Harvard Architecture, CISC and RISC Processors, Evolution of microprocessors and microcontrollers, Embedded system.	**04**	6
2.	**Introduction to Microprocessor architecture:** 8085 microprocessor architectural block diagram, Pin diagram and Pin functions, Bus organization, multiplexing of address/data bus, generation of control signals, Internal operations and registers, 8085 machine cycles; fetch and execution of MOV, STA/LDA, and IN/OUT instructions with timing diagram, Brief introduction of Instructions (Complete 8085 instruction set and programming using 8085 should not be included in exam), overview of 8086 microprocessor architecture.	**07**	14

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3.	**8051Microcontroller architecture**: Introduction to MCS-51Family microcontrollers, Architectural block Diagram, Pin diagram and Pin Functions, General Purpose and Special Function Registers, Oscillator and clock circuit, Reset circuit, I/O Port circuits, Internal program and data memory organization, stack pointer and stack memory, Interfacing external ROM/EEPROM and RAM with 8031/8051, Memory address decoding, timing diagram.	**10**	16
4.	**8051 Assembly Language and Embedded 'C' Programming:** Introduction to Program Development Tools**,** Concept of IDE, Editor, Assembler, Compiler, Linker, Simulator and Debugger, Assembler directives. **8051 Assembly Language Programming:** Programming model of 8051, Addressing modes, data transfer instructions, Arithmetic and Logical instructions, Bit manipulation instructions, Branching instructions, Concept of subroutine and related instructions, Assembly language programs (like block data transfer, time delay using loop, data conversions, use of lookup table etc) , I/O Port programming. **8051 Programming in Embedded C:** Data types, logic operations, control statements, loops, functions and array in embedded C, Data conversion programs, Accessing code ROM space using C, programming for time delay, I/O port programming in C.	**14**	22
5.	**8051 on-chip Peripherals and its Programming:** General purpose I/O Ports, Timers, timer modes, Interrupts, Interrupt control, ISR, Interrupt priority, Serial port, serial communication modes, serial interface protocols, SFRs for peripherals, Assembly and embedded C programming for peripherals.	**12**	22
6.	**Applications and design of microcontroller based systems:** Interfacing of LEDs, 7 Segment display, LCD display, Switches, Key denounce techniques, matrix Keyboard; Interfacing A/D and D/A converters, Relay, opto-isolator, Interfacing of stepper motor and DC motor; Temperature controller using LM35.	**09**	20
7.	**Introduction to 32-bit Arm Processors:** Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts and Vector Table, Core Extensions, Architecture Revisions, Arm Processor Families.	**04**	

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	**25**	**25**	**10**	**10**	**10**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and above Levels **(Revised Bloom's Taxonomy)**

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

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Reference Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1.	Microprocessor Architecture: Programming and Applications with the 8085	R. S. Gaonkar	Penram International Publishing	1999	Fourth
2.	The 8051Microcontroller and Embedded Systems: Using Assembly and C	M. A.Mazidi, J. G. Mazidi and R. D. McKinlay	Pearson Education	2013	second
3.	The 8051 Microcontroller & Embedded Systems using Assembly and C	K.J.Ayala D. V. Gadre	Cengage Learnning,	2010	
4.	Programming and Customizing the 8051Microcontroller	Myke Predko	Tata Mcgraw Hill	2011	
5.	Embedded System Design using C8051	Huang Han Way	Cengage Learnning.,	2009	First
6.	Using the MCS-51 Microcontrollers	H. W.Huang	Oxford UniPress	2000	
7.	Microprocessors and Microcontrollers	N. Senthilkumar, M. Saravanam, S. Jeevananthan	Oxford University Press	2016	second
8.	ARM Architecture Reference Manual	David Seal,	ARM Limited	2000	
9.	The Insider's Guide To The Philips ARM7-Based Microcontrollers	Trevor Martin,	Published by Hitex (UK) Ltd.	2005	
10.	Microprocessors and Interfacing	Dauglas V. Hall	Tata Mcgraw Hill	2006	second

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Apply the concept of buses, 8 bit microprocessor/microcontroller architecture and interrupts.	20
CO-2	Interface memory and I/O devices with 8 bit microprocessor/microcontroller.	15
CO-3	Use on-chip peripherals of microcontroller for developing applications.	20
CO-4	Develop program using 8051microcontroller in assembly and embedded ‘C’ language for various applications.	20
CO-5	Develop, debug and optimize code for microcontroller based system.	10
CO-6	Design microcontroller based system for various applications.	15

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Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	3	3	3	2	2	-	-	-	1	1	-	3	1	-	-
CO-2	3	3	3	2	3	-	-	-	1	1	-	3	1	2	-
CO-3	3	3	3	2	3	-	2	-	2	-	-	3	3	2	2
CO-4	3	3	3	3	3	-	2	-	3	-	-	3	3	3	-
CO-5	3	3	3	3	3	2	-	-	3	2	3	3	3	3	1
CO-6	3	3	3	3	3	2	3	2	3	3	3	3	3	2	2
Rationale *															

Rationale*: Explaining why it is matching this particular program outcome

LIST OF PRACTICALS: (Minimum –**10 to 12**--- need to be performed.)

1. Introduction to IDE and Assembler directives.
2. 8051 Assembly language programming for block data transfer between internal and external memory including over lapping blocks.
3. 8051 Assembly language programming based on Data transfer, Arithmetic and Logical group of instructions.
4. 8051 Assembly language programming for code conversions
5. 8051 Assembly language programming for Timers in different modes.
6. I/O port programming in assembly language and embedded C.
7. Timers and Counters programming in embedded C for time delay and frequency measurement using ISRs.
8. Programming for Emergency Alarm System using timer and external interrupt.
9. Embedded C programming for switching signal generation for 3-phase voltage source Inverter operating in 120˚/180˚ conduction mode using timer and ISR.
10. Serial communication and UART programming in Assembly/Embedded C.
11. Programming of matrix keyboard in embedded C.
12. Programming of parallel ADC and DAC in embedded C.
13. Speed Control of DC motor using PWM Technique and Microcontroller.
14. Designing of SCR firing scheme for converter using Microcontroller.
15. Interfacing stepper motor with microcontroller and programming.

Major Equipment:

Kit for 8051 Microcontroller**,** µVISION2/3/4 IDE, ADC/DAC card, Stepper motor and driver card, LCD/SVEN Segment display Card, oscilloscope, Power Supply

List of Open Source/learning website:

NPTEL Link https://nptel.ac.in/courses/106/105/106105193/

www.infineon.com, www.silabs.com , https://www.st.com, www.ti.com

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