FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Electrical Engineering)**

Semester: **V**

Course Code: **202050503**

Course Title: **Microprocessors and Microcontrollers**

Course Group: **Professional Core Course-VII**

Course Objectives: This subject focuses on the study of microprocessors and microcontrollers. It also aims to give understanding about interfacing of memory and I/O devices like LEDs, LCDs, A/D converter, D/A converter etc. Students will learn the programming language (assembly and embedded C) used for microcontrollers. After taking this course, one should be able to use these concepts for various microcontroller-based systems in electrical engineering related fields such as power system protection, instrumentation, power electronics, electrical drives and control of electrical equipment.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
Lecture	Tutorial	Practical		Theory		J/V/P*		Total
				Internal	External	Internal	External	
3	0	2	4	50 / 18	50 / 17	25/9	25/9	150 / 53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Microprocessor based systems & basics of 8085 microprocessor:** Digital computer, Microprocessor, Microcomputer, Microcontroller, Van Neumann and Harvard Architecture, CISC and RISC Processors. Architectural block diagram & pin diagram of 8085 microprocessor, Pin functions, Bus organization, Internal operations and registers, externally initiated operations.	04

2	**8051 Microcontroller architecture:** Introduction to MCS -51 family microcontrollers, Architectural block diagram, Pin diagram and pin functions, General purpose and special function registers, Oscillator and clock circuits, Reset circuit, I/O port circuits, Memory organization, Internal program and data memory, External memory interfacing.	**08**
3	**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 (like time delay using loop, data conversions HEX to ASCII, BCD to ASCII, use of look up table etc) in assembly language and testing the same using IDE.	**08**
4	**8051 Programming in C:** Data types in 8051 C, Programming for time delay, I/O programming, Logic operations, Control statements and loops in embedded C, Functions and arrays in embedded C, Data conversion programs, Accessing code ROM space, Data serialization.	**06**
5	**8051 Timer/Counter and Programming:** Timer/Counters and associated registers, Various modes of timer/counter operations, Use of timer as counter, Time delay programs in assembly language/embedded C.	**04**
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.	**04**
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.	**04**
8	**Applications and design of microcontroller-based systems:** Interfacing of LEDs, DIP Switches, Push Button switches, 7-Segment display device, LCD display, Key debounce techniques, Matrix Keyboard connections, Interfacing A/D converter, D/A converter, Relay, Opto-isolator stepper motor and DC motor.	**08**

List of Practicals / Tutorials:

1	Introduction to 8085 microprocessor, trainer kit and simulator.
2	Introduction to Program Development Tools (IDE) for Microcontrollers.
3	8051 assembly language programming based on data transfer and arithmetic instructions.
4	8051 assembly language programming using bit manipulation instructions.
5	8051 assembly language programming for logical operations and code conversion.

6	8051 programming based on embedded C.
7	8051 timer/counter programming using assembly language and C.
8	8051 serial programming using assembly and embedded C.
9	Interfacing of LEDs, Switches, Push Buttons and 7-segemnt Display with 8051.
10	Interfacing of LCD with 8051 microcontroller.
11	Interfacing of 4x4 Matrix Keypad with 8051 microcontroller.
12	Interfacing of DC Motor with 8051 microcontroller.
13	Interfacing of Stepper Motor with 8051 microcontroller.
14	Interfacing of ADC and DAC with 8051 microcontroller.
15	Interfacing Relay and opto-isolators using Microcontroller

Reference Books:

1	Microprocessor Architecture, Programming, and Applications with the 8085, By Romesh Gaonkar, Penram International Publishing (India) LTD.
2	The 8051 Microcontroller and Embedded Systems Using Assembly and C, 2/e by Muhammad Ali Mazidi, Janice Gillispie Mazidi and Rolin McKinlay, Pearson Education.
3	Using the MCS-51 Microcontrollers, by Han Way Huang, Oxford University Press.
4	Programming and customizing the 8051 Microcontroller, by Myke Predko, Tata McGraw Hill.
5	The 8051 Microcontroller & Embedded Systems using Assembly and C, by K. J. Ayala, D. V. Gadre, Cengage Learning (India Edition).

Supplementary learning Material:

1	https://nptel.ac.in/courses/108105102
2	https://nptel.ac.in/courses/117104072
3	www.silabs.com

Pedagogy:
- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Internal Evaluation: The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						R: Remembering; U: Understanding; A: Applying; N: Analyzing; E: Evaluating; C: Creating
R	**U**	**A**	**N**	**E**	**C**	
20%	20%	30%	10%	10%	10%	

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.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Describe 8085 microprocessor and MCS51 family microcontroller architecture.	**20**
CO-2	Develop assembly language/ embedded C language code for a given application.	**30**
CO-3	Configure a given microcontroller/ microprocessor-based system for timer-counter/serial communication/interrupt operation in assembly/embedded C.	**30**
CO-4	Interface appropriate peripheral devices, memory with microcontroller For given application/problem.	**20**

Curriculum Revision:	
Version:	2.0
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2025