Department of Electrical & Electronics Engineering

COURSE MODULE OF THE COURSE TAUGHT FOR THE SESSION 2024-2025 (EVEN SEM)

Course Syllabi with CO's

Faculty Member: **Kavyashree S**			Academic Year: 2024-2025				
Department: Electrical & Electronics Engineering			Batch : 2023-2027				
Course Code	Course Title	Core/Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
BEE403	**Microcontrollers**	**Core**	Logic Design, C programming	**3**	**-**	**2**	**50**
Objectives	1. To explain the internal organization and working of Computers, microcontrollers and embedded processors. 2. Compare and contrast the various members of the 8051 family. 3. To explain the registers of the 8051 microcontroller, manipulation of data using registers and MOV instructions. 4. To explain in detail the execution of 8051 Assembly language instructions and data types 5. To explain loop, conditional and unconditional jump and call, handling and manipulation of I/O instructions. 6. To explain different addressing modes of 8051, arithmetic, logic instructions, and programs. 7. To explain develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic. 8. To explain writing assembly language programs for data transfer, arithmetic, Boolean and logical instructions. 9. To explain writing assembly language programs for code conversions. 10. To explain writing assembly language programs using subroutines for generation of delays, counters, configuration of SFRs for serial communication and timers. 11. To perform interfacing of stepper motor and DC motor for controlling the speed. 12. To explain generation of different waveforms using DAC interface.						

Topics Covered as per Syllabus

Module-1

8051 Microcontroller Basics: Inside the Computer, Microcontrollers and Embedded Processors, Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051, IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins Of 8051. Memory Address Decoding, 8031/51 Interfacing With External ROM And RAM. 8051 Addressing Modes.

L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing.

Module-2

Assembly programming and instruction of 8051: Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and programs, Jump, loop and call instructions, IO port programming.

L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing.

Module-3

8051 programming in C: Data types and time delay in 8051C, IO programming in 8051C, Logic operations in 8051 C, Data conversion program in 8051 C, Accessing code ROM space in 8051C, Data serialization using 8051C

8051 Timer programming in Assembly and C: Programming 8051 timers, Counter programming, Programming timers 0 and 1 in 8051 C.

L2 – Understanding, L3 – Applying, L4 – Analyzing, L5 – Evaluating.

Module-4:

8051 serial port programming in assembly and C: Basics of serial communication, 8051 connection to RS232, 8051 serial port programming in assembly, serial port programming in 8051 C.

8051 Interrupt programming in assembly and C: 8051 interrupts, Programming timer, external hardware, serial communication interrupt, Interrupt priority in 8051/52, Interrupt programming in C.

L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing

Module- 5:

Interfacing: LCD interfacing, Keyboard interfacing.

ADC, DAC and sensor interfacing: ADC 0808 interfacing to 8051, Serial ADC Max1112 ADC interfacing to 8051, DAC interfacing, Sensor interfacing and signal conditioning.

Motor control: Relay, PWM, DC and stepper motor: Relays and opt isolators, stepper motor interfacing, DC motor interfacing and PWM.

8051 interfacing with 8255: Programming the 8255, 8255 interfacing, C programming for 8255

L1 – Remembering, L2 – Understanding, L3 – Applying, L4 – Analyzing.

Experiments

(to be carried out using discrete components)

Note: For the experiments 1 to 6, 8051 assembly programming is to be used.

1. Data transfer – Program for block data movement, sorting, exchanging, finding largest element in an array.
2. Arithmetic instructions: Addition, subtraction, multiplication and division. Square and cube.
3. Counters
4. Boolean and logical instructions (bit manipulation).
5. Code conversion programs – BCD to ASCII, ASCII to BCD, ASCII to decimal, Decimal to ASCII, Hexa to decimal.
6. Programs to generate delay, Programs using serial port and on-chip timer/counters.

Note: Single chip solution for interfacing 8051 is to be with C Programs for the following experiments.

7. Stepper motor interface.
8. DC motor interface for direction and speed control using PWM.
9. Alphanumerical LCD panel interface.
10. Generate different waveforms: Sine, Square, Triangular, Ramp using DAC interface.

Suggested Learning Resources:

1. The 8051 Microcontroller and Embedded Systems Using Assembly and C, Muhammad Ali Mazadi, Pearson, 2nd Edition, 2008.
2. The 8051 Microcontroller, Kenneth Ayala, Cengage, 3rd Edition, 2005.
3. Microcontrollers: Architecture, Programming, Interfacing and System Design, Raj Kamal, Pearson, 1st Edition, 2012.

Graduate Attributes:

Engineering Knowledge, Problem Analysis

Course Outcomes	At the end of the course the student will be able to: **CO1:** Outline the 8051 architecture, registers, internal memory organization, addressing modes. **CO2:** Discuss 8051 addressing modes, instruction set of 8051, accessing data and I/O port programming. **CO3:** Develop 8051C programs for time delay, I/O operations, I/O bit manipulation, logic and arithmetic operations, data conversion and timer/counter programming. **CO4:** Summarize the basics of serial communication and interrupts, also develop 8051 programs for serial data communication and interrupt programming. **CO5:** Program 8051to work with external devices for ADC, DAC, Stepper motor control, DC motor control.

CIE for the theory component of IPCC

Two Tests each of 20 Marks (duration 01 hour)

- First test at the end of 5th week of the semester
- Second test at the end of the 10th week of the semester

Two assignments each of 10 Marks

- First assignment at the end of 4th week of the semester
- Second assignment at the end of 9th week of the semester

Scaled-down marks of two tests and two assignments added will be CIE marks for the theory component of IPCC for 30 marks.

CIE for the practical component of IPCC

- On completion of every experiment/program in the laboratory, the students shall be evaluated and marks shall be awarded on the same day. The15 marks are for conducting the experiment and preparation of the laboratory record, the other 05 marks shall be for the test conducted at the end of the semester.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to 15 marks.
- The laboratory test (duration 03 hours) at the end of the 15th week of the semester /after completion of all the experiments (whichever is early) shall be conducted for 50 marks and scaled down to 05 marks. Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for 20 marks.

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Course Code:	**BEE403**	**TITLE: Microcontrollers**						Faculty Member: **Kavyashree S**			
List of Course Outcomes	**Program Outcomes**										
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO-1	2	2	-	-	3	-	-	-	2	2	-	2
CO-2	2	3	2	2	3	-	-	-	3	2	-	2
CO-3	2	3	2	2	3	-	-	-	3	2	-	2
CO-4	2	3	2	2	3	-	-	-	3	2	-	2
CO-5	2	3	2	2	3	-	-	-	3	2	-	2

Note: 3 = Strong Contribution 2 = Average Contribution 1= Weak Contribution - = No Contribution

The Correlation of Course Outcomes (CO's) and Program Specific Outcomes (PSO's)

Course Code:	**BEE403**	**TITLE: Microcontrollers**
List of Course Outcomes	**Program Specific Outcomes**	
	PSO1	**PSO2**
CO-1	-	3
CO-2	-	3
CO-3	-	3
CO-4	-	3
CO-5	-	3

Note: 3 = Strong Contribution 2 = Average Contribution 1 = Weak Contribution - = No Contribution

Course Coordinator Vertical Head HOD