Micro-Controllers and Embedded Systems Laboratory

Course Code	22CSL59	Course type	PCCL	Credits L-T-P	0 - 0 - 1
Hours/week: L - T- P	0 - 0 - 2			Total credits	1
Total Contact Hours	L = 0 Hrs; T = 0 Hrs; P = 20 Hrs Total = 20 Hrs			CIE Marks	50
Flipped Classes content	--			SEE Marks	50

Course learning objectives	
1.	To guide students in mastering the programming of microcontrollers using Embedded 'C', ensuring they can develop robust and efficient code for embedded applications.
2.	To instruct students on how to interface microcontrollers with a variety of peripheral devices, including sensors, actuators, displays, and communication modules, enhancing their practical skills and system integration capabilities.
3.	To facilitate students' understanding of hardware components by designing and conducting experiments that explore the functionalities of embedded systems, fostering hands-on learning and practical problem-solving skills.

Required Knowledge of : Digital Electronics, 'C' Programming.

List of Experiments

Lab Experiment – I	Contact Hours = 2 Hours
8051 I/O Programming.	
Lab Experiment – 2	**Contact Hours = 2 Hours**
Led Interfacing.	
Lab Experiment – 3	**Contact Hours = 2 Hours**
Timer Programming.	
Lab Experiment – 4	**Contact Hours = 2 Hours**
Counter Programming.	
Lab Experiment – 5	**Contact Hours = 2 Hours**
Liquid Crystal Display Interfacing.	
Lab Experiment – 6	**Contact Hours = 2 Hours**
Digital to Analog Converter (DAC) Interfacing.	
Lab Experiment – 7	**Contact Hours = 2 Hours**
Stepper Motor Interfacing.	
Lab Experiment – 8	**Contact Hours = 2 Hours**
Serial Port Programming.	
Lab Experiment – 9	**Contact Hours = 2 Hours**

Interrupt Programming.	
Lab Experiment – 10	**Contact Hours = 2 Hours**
Sensor and Actuator Interfacing.	

Books	
	Text Books:
1.	Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D. McKinlay, The 8051 Microcontroller and Embedded Systems: Using Assembly and C, Pearson, Second Edition onwards.
2.	Marilyn Wolf, Computers as Components Principles of Embedded Computing System Design, Morghan Kaufmann Elsevier, Third Edition onwards.
	Reference Books:
1.	David Calcutt, Frederick Cowan, and Hassan Parchizadeh, 8051 Microcontroller: An Applications Based Introduction
2.	Shibu K V, "Introduction to Embedded Systems", Tata McGraw Hill Education, Private Limited, 2nd Edition.
	E-resources (NPTEL/SWAYAM.. Any Other)- mention links
1.	**https://onlinecourses.nptel.ac.in/noc20_ee42/preview**
2.	https://onlinecourses.nptel.ac.in/noc20_ee98/preview

Course delivery methods		**Assessment methods**	
1.	Practice session/Demonstrations in Labs	1.	Conduction of Experiments
2.	Virtual Labs (if present)	2.	Journal writing
3.	Chalk and Talk	3.	Lab project/ Open ended experiment
4.		4.	Lab Test
5.		8.	Semester End Examination

Course Outcome (COs)

Learning Levels:

Re - Remember; Un - Understand; Ap - Apply; An - Analysis; Ev - Evaluate; Cr - Create

At the end of the course, the student will be able to		**Learning Level**	**PO(s)**	**PSO(s)**
1.	**Apply** programming concepts to effectively code microcontrollers using Embedded 'C'.	**Ap**	1,2	1
2.	**Analyze** the specifications of various peripheral devices and determine suitable interfacing methods with microcontrollers based on their functionalities.	**An**	1,2,3,5	1,2
3.	**Apply** knowledge of embedded systems hardware to design circuits and select appropriate components for specific applications.	**Ap**	1,2,3,5	1,2
4.	**Analyze** the requirements for a real world problem or a specification and develop a course project as the solution	**An**	1,2,3,5, 9,10,11,12	1,2,3

Scheme of Continuous Internal Evaluation (CIE):

Conduction of experiments & viva-voce	Journal	Lab project/ Open ended expt	Lab Test	Total
20 marks	5 marks	10 marks	15	50 marks

Conduct of Lab:

1. Conduction of the experiment: 15 marks + Viva voce: 5 marks
2. Calculations, results, graph, conclusion and Outcome recorded in Journal: 5 marks
3. Lab project/ Open ended expt: 10 marks
4. Lab Test: 15 marks

Eligibility for SEE:

1. 40% and above (20 marks and above)
2. **Lab test is COMPULSORY**

Scheme of Semester End Examination (SEE):			
1.	It will be conducted for 50 marks of 2/3 hours duration.		
2.	**Minimum marks required in SEE to pass:** Score should be ≥35% , however overall score of CIE+SEE should be ≥40%.		
2.	One or Two experiments to be conducted.		
3.	Minimum marks required in SEE to pass: 20 out of 50		
4.	Initial write up	10 marks	50 marks
	Conduct of experiments, results and conclusion	20 marks	
	One mark question	10 marks	
	Viva- voce	10 marks	
5.	Viva-voce shall be conducted for individual student and not in a group.		

CO-PO Mapping (planned)													**CO-PSO Mapping (planned)**		
CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
1	✓	✓											✓	✓	
2	✓	✓	✓		✓								✓	✓	
3	✓	✓	✓		✓								✓	✓	
4	✓	✓	✓		✓				✓	✓	✓	✓	✓	✓	✓
Tick mark the CO, PO and PSO mapping															

Sl No	Skill & competence enhanced after undergoing the course	Applicable Industry Sectors & domains	Job roles students can take up after undergoing the course
1	Programming Proficiency	Embedded System and IoT Application.	Embedded Engineers
2	Peripheral Interfacing	Embedded System and IoT Application.	Embedded- IoT- Firmware Design Engineer
3	Hardware Design and Selection	Embedded System and IoT Application.	Embedded- IoT- Firmware Design Engineer