Program :	Diploma in Electronics/ Electronics and Communication Engineering/ Biomedical Engineering
Course Code :**4046**	Course Title: **Microcontroller and Applications Lab**
Semester :**4**	Credits: **1.5**
Course Category: **Program Core**	
Periods per week: **3 (L:0, T:0, P:3)**	Periods per semester:**45**

Course Objectives:

- To equip the student with the concept of coding microcontrollers using ASM.
- To encourage students to utilize internet resources for working out simple day to day applications.
- To enable the student to code any similar microcontroller in ASM.

Instructions:

1. 8051 datasheet shall be provided.
2. The functions or header filesrequired to solve the given problems such as problems involving LCDs, ADC, Serial communications, Matrix keyboard etc. shall be provided along with the problem statement.

Tools and Equipments:

1. Keil µVision.
2. 89C51 prototype board to support IO ports, ADC, LCD display, 7 segment LED display, 4x4 matrix keyboard, Relay and Buzzer interface, USB compatible programmer.
3. Computer system to support Keil µVision.

Course Prerequisites:

Topic	Course code	Course name	Semester
Number system and codes, combinational sequential circuits		Digital Electronics theory & Lab	3
Concept of microcontroller programming		Electronics Tinkering workshop	2

Course Outcomes:

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive level
CO1	Demonstrate usage of IDE (Integrated Development Environment), 8051 prototyping kit for embedded interfacing, ASM coding and debugging.	9	Understanding
CO2	Apply concept of I/O ports to interface LED, switches and displays.	15	Applying
CO3	Develop interfacing applications using timer, interrupt and ADC.	6	Applying
CO4	Apply serial data transfer to interface DC motor and data communication between devices.	9	Applying
	Lab Exam	6	

CO-POMapping:

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	2			3			
CO2	3		3				
CO3	3		3				
CO4	3		3				

3-Strongly mapped, 2-Moderately mapped, 1-Weakly mapped

Course Outline:

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Demonstrate usage of IDE, 8051 prototyping kit for embedded interfacing, ASM coding and debugging.**		
M1.01	Demonstrate installation, configuring, and usage of Keil **μ**Vision, and prototyping kit.	3	Understanding
M1.02	Make use of basic ASM instructions to perform arithmetic, logic operations.	3	Understanding
M1.03	Make use of basic ASM instructions to perform code conversions.	3	Understanding
CO2	**Apply concept of I/O ports to interface LED, switches and displays.**		
M2.01	Apply the concept of port as output to Interface 8 LEDs.	3	Applying

M2.02	Apply the concept of port as input to read switches and send the status to LEDs connected to another port.	3	Applying
M2.03	Apply the concept of software delay to toggle LEDs connected to port at required time interval	3	Applying
M2.04	Demonstrate the interfacing with LCD display (by utilizing the given subroutine for 16x2 LCD Display).	3	Understanding
M2.05	Make use of keyboard read function to interface matrix keyboard.	3	Applying
	Lab Exam 1	3	
CO3	**Develop interfacing applications using timer, interrupt and DC motor.**		
M3.01	Apply the concept of timer to toggle LED at specific interval. (Required data sheets with register structure related with Timer programming shall be provided)	3	Applying
M3.02	Experiment with 8051 to interface DC motor.	3	Applying
CO4	**Apply serial data transfer to interface DC motor and data communication between devices.**		
M4.01	Construct ADC interface to read and display room temperature.	3	Applying
M4.02	Experiment with 8051 to interface unipolar stepper motor.	3	Applying
M4.03	Develop program to transfer data between micro controller and computer using serial communication	3	Applying
	Lab Exam 2	3	

Student Activity

Suggested Open-ended Experiments:

Open-ended experiments as individual or group of 2-3. There shall be no duplication in experiments. This can be evaluated for the purpose of continuous internal evaluation at a score of 15 marks. Students should document the experiment on the record book.

Example:

1) Develop temperature controller such that if temperature exceed 28° C, ceiling fan should be switched on.

2) Develop counter to count from 0 to 255 and display on 16x2 LCD.

3) Construct blue tooth controller to switch bulb ON/OFF using mobile phone.

4) Utilize 16 x 2 LCD to display room temperature.

Text / Reference:

T/R	Book Title/Author
T1	Muhammad Ali Mazidi and Janice GillispieMazidi - The 8051 Microcontroller and Embedded Systems Using Assembly and C - Pearson Education- Second Edition

Online Resources:

Sl.No	Website Link
1	https://www.tutorialspoint.com
2	https://www.electronicshub.org

Sample Questions to Test Outcomes

1. Develop Assembly Language Program (ALP) to switch on the lights automatically, when a person enters the room.

2. Develop an ALP to close the shutter of car parking area automatically, when it is filled with vehicles.