CODE	COURSE NAME	CATEGORY	L	T	P	CREDIT
EEL331	MICROPROCESSORS AND MICROCONTROLLERS LAB	PCC	0	0	3	2

Preamble : This laboratory course is designed to train the students to familiarize and program microprocessors and microcontrollers. Students will also be introduced to a team working environment where they develop the necessary skills for planning, preparing and implementing embedded systems.

Prerequisite : Fundamentals of Digital Electronics and C programming

Course Outcomes : After the completion of the course the student will be able to

CO 1	Develop and execute assembly language programs for solving arithmetic and logical problems using microprocessor/microcontroller.
CO 2	Design and Implement systems with interfacing circuits for various applications.
CO 3	Execute projects as a team using microprocessor/microcontroller for real life applications.

Mapping of course outcomes with program outcomes

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

ASSESSMENT PATTERN:

Mark distribution:

Total Marks	CIE marks	ESE marks	ESE Duration
150	75	75	3 hours

Continuous Internal Evaluation (CIE) Pattern:

Attendance	Regular Lab work	Internal Test	Course Project	Total
15	30	25	5	**75**

Internal Test Evaluation (Immediately before the second series test)

End Semester Examination (ESE) Pattern:

The following guidelines should be followed regarding award of marks

(a) Preliminary work : 15 Marks

(b) Implementing the work/Conducting the experiment : 10 Marks

(c) Performance, result and inference (usage of equipments and trouble shooting) : 25 Marks

(d) Viva voce : 20 marks

(e) Record : 5 Marks

General instructions : Practical examination is to be conducted immediately after the second series test after conducting 12 experiments from the list of experiments given below. Evaluation is a serious process that is to be conducted under the equal responsibility of both the internal and external examiners. The number of candidates evaluated per day should not exceed 20. Students shall be allowed for the University examination only on submitting the duly certified record. The external examiner shall endorse the record.

LIST OF EXPERIMENTS:

(12 experiments are mandatory)

8085 Microprocessor Programming

1. Data transfer using different addressing modes and block transfer.
2. (a) Arithmetic operations in binary and BCD: addition, subtraction, multiplication and division

   (b) Logical instructions- sorting of arrays in ascending and descending order.

   (c) Binary to BCD conversion and vice versa.

8051 Microcontroller Programming

3. ALP programming for

   (a) Data transfer: Block data movement, exchanging data, sorting, finding largest element in an array.

   (b) Arithmetic operations: Addition, subtraction, multiplication and division. Computation of square and cube of 16-bit numbers.

4. ALP programming for the implementation of counters: HEX up and down counters, BCD up/down counters

5. (a) ALP programming for implementing Boolean and logical instructions: bit manipulation.

   (b) ALP programming for implementing conditional call and return instructions: Toggle the bits of port 1 by sending the values 55H and AAH continuously, Factorial of a number

6. ALP programming for

   (a) Generation of delay

(b) Transmitting characters to a PC HyperTerminal using the serial port and displaying on the serial window

7. C Programs for stepper motor control.

8. C Programs for DC motor direction and speed control using PWM.

9. C Programs for Alphanumerical LCD panel/ keyboard interface.

10. C Programs for ADC interfacing.

11. Demo Experiments using 8085 Microprocessor Programming

(a) Digital I/O using PPI: square wave generation.

(b) Interfacing D/A converter- generation of simple waveforms-triangular, ramp etc.

(c) Interfacing A/D converter.

12. Demo Experiments using 8051 Microcontroller Programming

ALP programming for implementing code conversion– BCD to ASCII, ASCII to BCD, ASCII to decimal, Decimal to ASCII, Hexadecimal to Decimal and Decimal to Hexadecimal.

13. a) Familiarization of Arduino IDE

b) LED blinking with different ON/OFF delay timings with i) inbuilt LED ii) Externally interfaced LED

14. Arduino based voltage measurement of 12V solar PV module/ 12V battery and displaying the measured value using I2C LCD display.

15. Arduino based DC current measurement using Hall-effect current sensor like LEM LA-55P sensor and displaying the value using I2C LCD module.

16. DC motor speed control using MOSFET driven by PWM signal from Arduino module.

17. Write a program on Arduino/Raspberry Pi to upload temperature and humidity data to thingspeak cloud.

18. Write a program on Arduino/Raspberry Pi to retrieve temperature and humidity data from thingspeak cloud.

Mandatory Group Project Work : Students have to do a mandatory micro project (group size not more than 3 students) to realise an embedded system for Industrial Control/ day-to-day life applications. A report also is to be submitted. Performance can be evaluated along with the internal test and a maximum of 5 marks shall be awarded.

Example projects (Microcontroller based projects)

1. Temperature Monitoring and control System.
2. Home automation system
3. Remote health monitoring and emergency notification system
4. IoT based power monitoring
5. IoT based switching of power devices

Reference Books:

1. Ramesh Gaonkar, Microprocessor Architecture Programming and Applications, Penram International Publishing; Sixth edition, 2014.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi," The 8051 microcontroller and embedded systems using Assembly and C", second edition, Pearson/Prentice hall of India.
3. Kenneth. J. Ayala, The 8051 microcontroller, 3rd edition, Cengage Learning, 2010
4. Donald P. Leach, Albert Paul Malvino and Goutam Saha, Digital Principles and Applications, 8/e, by McGraw Hill.
5. A. P. Mathur, Introduction to Microprocessors, Tata McGraw Hill Publishing Company Limited, New Delhi.
6. Jeeva Jose, Internet of Things, Khanna Publishing House, Delhi
7. Raj Kamal, Internet of Things: Architecture and Design, McGraw Hill