# SEMESTER: S5
# MICROCONTROLLER LAB

| Course Code | PCICL507 | CIE Marks | 50 |
|---|---|---|---|
| Teaching Hours/Week (L: T:P: R) | 0:0:3:0 | ESE Marks | 50 |
| Credits | 2 | Exam Hours | 2 Hrs. 30 Min. |
| Prerequisites (if any) | PBICT504 | Course Type | Lab |

**Course Objectives:**

1. Proficiency in Microcontroller Programming
2. Hands-on Experience with Microcontroller Interfacing
3. Introduction to Arduino-Based Systems Development

| Expt. No. | Experiments |
|---|---|
| **A) Assembly Language programming of 8051 Family in Keil/Ride environment: (All experiments compulsory)** | |
| 1 | Examples of arithmetic operations |
| 2 | Examples of logical operation |
| 3 | Examples using simulated ports, timers |
| 4 | Examples of serial communication |
| **B) C language programming of 8051 Family in Keil/Ride environment (All experiments compulsory)** | |
| 5 | Examples of arithmetic and logical operations. |
| 6 | Examples using simulated ports, timers. |
| 7 | Examples of serial communication. |
| **C) Using microcontroller kits (Minimum 3 experiment)** | |
| 8 | Interfacing LED |
| 9 | Interfacing LCD displays |
| 10 | Keypad scanning |
| 11 | Interfacing buzzers |
| 12 | Interfacing ADC and DAC |
| 13 | Interfacing stepper motor |

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| D) Using Arduino Board (Minimum 1 experiment) | |
|---|---|
| 14 | Interfacing LED |
| 15 | Interfacing LEDs, switches and various sensors |
| 16 | Design systems to control physical actuation devices like hydraulic piston, Motors etc |

## Course Assessment Method
## (CIE: 50 marks, ESE: 50 marks)

**Continuous Internal Evaluation Marks (CIE):**

| Attendance | Preparation/Pre-Lab Work experiments, Viva and Timely completion of Lab Reports / Record (Continuous Assessment) | Internal Examination | Total |
|---|---|---|---|
| 5 | 25 | 20 | 50 |

**End Semester Examination Marks (ESE):**

| Procedure/ Preparatory work/Design/ Algorithm | Conduct of experiment/ Execution of work/ troubleshooting/ Programming | Result with valid inference/ Quality of Output | Viva voce | Record | Total |
|---|---|---|---|---|---|
| 10 | 15 | 10 | 10 | 5 | 50 |

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- ***Submission of Record: Students shall be allowed for the end semester examination only upon submitting the duly certified record.***
- ***Endorsement by External Examiner:*** *The external examiner shall endorse the record*

## Course Outcomes (COs)

At the end of the course students should be able to:

| Course Outcome | | Bloom's Knowledge Level (KL) |
|---|---|---|
| **CO1** | Do 8051 microcontrollers programming in assembly language. | **K3** |
| **CO2** | Do 8051 microcontrollers programming in C language. | **K3** |
| **CO3** | Interface Microcontroller with peripheral devices and I/O operations | **K3** |
| **CO4** | Design programming in the Arduino board and implement microcontroller-based real-life projects. | **K3** |
| **CO5** | Demonstrate skills in technical communication and team work. | **K3** |

Note*: K1- Remember, K2- Understand, K3- Apply, K4- Analyse, K5- Evaluate, K6- Create*

**CO- PO Mapping (Mapping of Course Outcomes with Program Outcomes)**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | | | | | | | | | | | 3 |
| **CO2** | 3 | | | | | | | | | | | 3 |
| **CO3** | 3 | 3 | 3 | | 3 | | | | | | | 3 |
| **CO4** | 3 | 3 | 3 | 2 | 3 | | | | | | 3 | 3 |
| **CO5** | | | | | | | | | | 3 | | |

*1: Slight (Low), 2: Moderate (Medium), 3: Substantial (High), -: No Correlation*

| **Text Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| 1 | The 8051 Microcontroller and Embedded Systems using Assembly and C | Muhammed Ali Mazidi and Janice Gillispie Mazidi | Pearson Education | 3rd edition, 2007 |
| 2 | AVR Microcontroller and Embedded Systems: Using Assembly and C | Muhammad Ali Mazidi, Zarmad Naimi | Pearson Education | 1st edition, 2019 |

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| **Reference Books** | | | | |
|---|---|---|---|---|
| **Sl. No** | **Title of the Book** | **Name of the Author/s** | **Name of the Publisher** | **Edition and Year** |
| **1** | The 8051 Microcontroller | Kenneth Ayala | Cengage Learning India | 3rd edition, 2007 |
| **2** | Microcontroller and Applications | Mrs. Manjushri S. Joshi, Mrs. Vijaya V. Pangave | Nirali Prakashan | 1st edition, 2019 |
| **3** | Arduino – A Technical Reference: A Handbook for Technicians, Engineers, and Makers | J.m Hughes | O'Reilly; | 1st edition, 2016 |
| **4** | The 8051 Microcontroller | Kenneth Ayala | Cengage Learning India | 3rd edition, 2007 |

| Video Links (NPTEL, SWAYAM…) | |
|---|---|
| **Module No.** | **Link ID** |
| **1** | https://nptel.ac.in/courses/117104072 |
| **2** | https://nptel.ac.in/courses/108105102 |

## Continuous Assessment (25 Marks)

1. **Preparation and Pre-Lab Work (7 Marks)**

   - Pre-Lab Assignments: Assessment of pre-lab assignments or quizzes that test understanding of the upcoming experiment.
   - Understanding of Theory: Evaluation based on students' preparation and understanding of the theoretical background related to the experiments.

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2. **Conduct of Experiments (7 Marks)**

   - Procedure and Execution: Adherence to correct procedures, accurate execution of experiments, and following safety protocols.
   - Skill Proficiency: Proficiency in handling equipment, accuracy in observations, and troubleshooting skills during the experiments.
   - Teamwork: Collaboration and participation in group experiments.

3. **Lab Reports and Record Keeping (6 Marks)**

   - Quality of Reports: Clarity, completeness and accuracy of lab reports. Proper documentation of experiments, data analysis and conclusions.
   - Timely Submission: Adhering to deadlines for submitting lab reports/rough record and maintaining a well-organized fair record.

4. **Viva Voce (5 Marks)**

   - Oral Examination: Ability to explain the experiment, results and underlying principles during a viva voce session.

***Final Marks Averaging: The final marks for preparation, conduct of experiments, viva, and record are the average of all the specified experiments in the syllabus.***

## Evaluation Pattern for End Semester Examination (50 Marks)

1. **Procedure/Preliminary Work/Design/Algorithm (10 Marks)**

    - Procedure Understanding and Description: Clarity in explaining the procedure and understanding each step involved.
    - Preliminary Work and Planning: Thoroughness in planning and organizing materials/equipment.
    - Algorithm Development: Correctness and efficiency of the algorithm related to the experiment.
    - Creativity and logic in algorithm or experimental design.

2. **Conduct of Experiment/Execution of Work/Programming (15 Marks)**

    - Setup and Execution: Proper setup and accurate execution of the experiment or programming task.

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3. **Result with Valid Inference/Quality of Output (10 Marks)**

    - Accuracy of Results: Precision and correctness of the obtained results.
    - Analysis and Interpretation: Validity of inferences drawn from the experiment or quality of program output.

4. **Viva Voce (10 Marks)**

    - Ability to explain the experiment, procedure results and answer related questions
    - Proficiency in answering questions related to theoretical and practical aspects of the subject.

5. **Record (5 Marks)**

    - Completeness, clarity, and accuracy of the lab record submitted