

## NIRMA UNIVERSITY

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| Institute:            | Institute of Technology  |
| Name of Programme:    | Minor in Industrial Automation (Inter-disciplinary) Offered by B.Tech. in Electronics and Instrumentation Engineering. |
| Semester:             | V  |
| Course Code:          | 3EI103IC24   |
| Course Title:         | Programmable Logic Controller  |
| Course Type:          | Core Course - I under Minor (Interdisciplinary)  |
| Year of Introduction: | 2024-25  |

| L | T | Practical component |    |   |   | C |
|---|---|---------------------|----|---|---|---|
|   |   | LPW                 | PW | W | S |   |
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### Course Learning Outcomes (CLOs):

At the end of the course, the students will be able to –

1. understand the fundamental principles of programmable logic controller (BL2)
2. develop the PLC programme using standard programming techniques (BL4)
3. design programs using IEC standards programming software (BL4)
4. apply PLC project programming for various applications. (BL4)

| Unit            | Contents  | Teaching hours<br>(Total 45) |
|-----------------|---|------------------------------|
| <b>Unit-I</b>   | <b>Introduction</b><br>Introduction, Evolution History, IEC standards, Importance of PLC, type of PLC's and basic architecture  | <b>04</b>                    |
| <b>Unit- II</b> | <b>Internal architecture and interfacing module</b><br>CPU, Memory Organization, Power Supply, Input/ Output Interface, Analog and digital input-output modules, Special purpose modules.                                       | <b>05</b>                    |
| <b>Unit-III</b> | <b>Basic operation and programming</b><br>IEC standards for PLC programming, PLC operation, Ladder logic, Logic functions, Basic relay instructions, Timer/Counter Instructions, string operators.                              | <b>12</b>                    |
| <b>Unit- IV</b> | <b>PLC programming instructions</b><br>Comparison, Arithmetic, Logical, Data handling, input-output instructions, Data handling instructions, Data Conversions instructions, Case studies of different industrial applications. | <b>12</b>                    |
| <b>Unit- V</b>  | <b>PLC project development</b><br>PLC specification and selection criteria, Sensor/Actuator selection, wiring connection with sourcing and sinking module, Wiring diagram, communication methods                                | <b>12</b>                    |

### Self Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self study contents.

### Laboratory Work:

This shall consist of at least 10 practical based on the above syllabus.



### **Suggested Reading:**

1. Programmable Logic Controllers, Frank Petruzzola, Tata Mc-Graw Hill
2. Programmable Logic Controllers Principles and Applications, John W. Webb, Ronald A. Reis, Prentice Hall of India Publication
3. Programmable Logic Controllers Industrial Automation an Introduction, Madhuchand Mitra and Samerjit Sengupta, Penram International Publishing Pvt. Ltd.
4. Programmable Logic Controllers Principles and Applications, J. R. Hackworth and F. D. Hackworth, Pearson publication

### **Suggested List of Experiments (not restricted to the following): (Only for Information)**

- |   |           |
|---|-----------|
| 1. To understand the programming and architecture of PLC.         | ( 02 Hrs) |
| 2. Programming PLC with relay based instructions.                 | ( 02 Hrs) |
| 3. Programming of PLC using Timer Instructions.                   | ( 02 Hrs) |
| 4. Programming of PLC using Counter Instructions.                 | ( 02 Hrs) |
| 5. Programming of PLC using Mathematical Instruction.             | ( 02 Hrs) |
| 6. Programming of PLC using Comparison and Logical instructions.  | ( 02 Hrs) |
| 7. Programming of PLC uses data handling and moving instructions. | ( 02 Hrs) |
| 8. Design drum level control system.                              | ( 02 Hrs) |
| 9. Design temperature control system.                             | ( 04 Hrs) |
| 10. To Prepare a demonstration of control system using PLC.       | ( 04 Hrs) |

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. the academic year 2024 - 25 and onwards