## Faculty of Engineering & Technology

## PLC and Applications

**Information :**

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| **Course Code :** | EPR 473 | **Level** : | Undergraduate | **Course Hours :** | 3.00- Hours |

| **Department :** | Specialization of Electrical Power Engineering |
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**Instructor Information :**

| Title | Name | Office hours |
|---|---|---|
| Professor | Naser Mohammed Bayoumy AbdelRahim | 2 |
| Teaching Assistant | Shahd Muhammed Anwer Muhammed Hamed | 2 |

**Area Of Study :**

1. Develop the student's knowledge about various components of PLCs and PLC systems.
2. Prepare the student to write a PLC ladder diagram for different control systems.
3. Train the student to perform basic experiments using PLCs.
4. Familiarize the students with various network topologies used in industrial control systems

**Description :**

Logic Gates ; Types of control systems, Structure of programmable logic controllers.,   Basic set of instructions, Timers, Counters, Registers, Applications., Control systems using sequential PLC, Development of step programs, Controllers of displacement, Step function., Programming of different industrial control circuits., Input / Output data handling analysis., Sensors., Interfacing between controllers. Scada system.

**Course outcomes :**

**a.Knowledge and Understanding: :**

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| 1 - | Review of classical industrial control systems and motivation for microprocessor-based systems |
| 2 - | utline the building blocks of a Programmable Logic Controllers/ Microprocessor-based controller and describer the function of its various blocks. Identify various types of input/output modules of a PLC. |
| 3 - | desrcibe various control tasks/processes for industrial control systems using ladder programming language. |
| 4 - | Identify various PLC timers and counters and their main features. |
| 5 - | Describe various types of industrial networking and recognize their unique features. |

**b.Intellectual Skills: :**

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| 1 - | Write combinational and sequential control tasks related to industrial processes. |
| 2 - | Create PLC programs for different industrial processes. |
| 3 - | Select appropriate type of timers for a specific industrial process |
| 4 - | Select appropriate type of counters for a specific industrial process. |

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**c.Professional and Practical Skills: :**

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| 1 - | Examine different control circuits using PLC software programming. |
| 2 - | Implement simple and complicated different control circuits. |
| 3 - | Select appropriate Control solution techniques on simple industrial control circuits in the lab. |

**d.General and Transferable Skills: :**

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| 1 - | Work in stressful environment and within constraints. |
| 2 - | Communicate effectively. |
| 3 - | Effectively manage tasks, time, and resources. |

**Course Topic And Contents :**

| Topic | No. of hours | Lecture | Tutorial / Practical |
|---|---|---|---|
| Introduction to the operation of industrial classical control systems | 7 | 3 | 4 |
| Introduction of modern industrial control systems and motivation for using PLC | 3 | 3 | 0 |
| Architecture of PLCs | 5 | 3 | 2 |
| Input / Output devices. | 8 | 6 | 2 |
| Input / Output modules. | 5 | 3 | 2 |
| Ladder and Functional Block Programming | 12 | 6 | 6 |
| Operation and control using Timers, Counters, | 12 | 6 | 6 |
| Programming of different industrial processes using timers and counters | 12 | 6 | 6 |
| Process control, Networking | 8 | 6 | 2 |
| Scada system. | 3 | 3 | 0 |

**Teaching And Learning Methodologies :**

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| Interactive Lecture |
| Discussion |
| Problem solving |
| Experiential learning |
| Cooperative learning |

**Course Assessment :**

| Methods of assessment | Relative weight % | Week No | Assess What |
|---|---|---|---|
| • Final exam | 40.00 | 15 | to assess the comprehensive understanding of the scientific background of the course, to assess the ability of problem solving with different techniques studied |
| Mid- Exam I | 15.00 | | |
| Mid- Exam II | 15.00 | | |
| o Lab | 10.00 | | |

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| o Participations | 10.00 | | |
| o Quizzes | 10.00 | | |

**Recommended books :**

(1) W. Bolton, Programmable Logic Controllers, 6th edition, Elsevier, 2015, ISBN 978-0-12-802929-9.
(2) F. D. Petruzella, Programmable Logic Controllers,5th edition, McGraw-Hill Education, 2017, ISBN 978-0-07-337384-3.
(3) Ian G. Warmock, Programmable Controllers Operations and Applications, Prentice Hall 1979

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