

Introduction to Programmable Logic Controllers (PLCs)

Course Description

This course provides a comprehensive introduction to Programmable Logic Controllers (PLCs) and their critical role in industrial automation. Participants will gain foundational knowledge of PLC hardware, architecture, and programming. The course also covers essential topics such as Safety PLCs, data types, and programming using Function Block Diagram (FBD) and Statement List (STL). Additionally, the course introduces IEC 61131-3 programming standards and industrial communication protocols like Modbus and IO-Link. By the end of this course, learners will be equipped with the necessary skills to understand, configure, and implement PLC-based automation systems.

Audience Profile

This course is designed for:

- Engineering students and professionals new to industrial automation.
- Technicians and maintenance personnel working with PLC-based systems.
- Automation engineers looking to enhance their understanding of PLC hardware and programming.
- Manufacturing professionals interested in learning about industrial control systems.

Prerequisites

Participants should have:

- Basic knowledge of electrical and electronic circuits.
- Familiarity with industrial processes (recommended but not mandatory).
- An understanding of fundamental computer operations.

Course Objectives

By the end of this course, participants will be able to:

- Understand the fundamental concepts of PLCs and their applications in automation.
- Identify the components of a PLC and their functions.
- Differentiate between various types of control systems and their industrial applications.
- Explain PLC hardware architecture and I/O addressing.
- Understand the role of Safety PLCs in industrial environments.
- Identify and use different data types in PLC programming.
- Develop basic PLC programs using Function Block Diagram (FBD) and Statement List (STL).
- Understand the IEC 61131-3 standard for PLC programming languages.

- Gain an overview of industrial communication protocols like Modbus and IO-Link.

Table of Contents (TOC)

Module 1: Introduction to PLCs

- What is a PLC?
- History and applications of PLCs.
- Advantages of PLCs over traditional control systems.

Module 2: Basics of Automation

- Definition and importance of automation.
- Types of control systems: Open Loop vs. Closed Loop.
- PLCs in industrial automation.

Module 3: Components of a PLC

- Power supply, CPU, I/O modules, memory.
- Types of input and output devices (digital and analog).
- Overview of communication modules.

Module 4: PLC Hardware Architecture

- PLC signal flow and block diagram.
- Understanding I/O addressing and mapping.
- Expansion modules and system connectivity.

Module 5: Safety PLCs and Their Role in Control Systems

- Introduction to Safety PLCs.
- Key features of Safety PLCs.
- Role of Safety PLCs in control systems.

Module 6: Data Types in PLCs

- Introduction to data types in PLCs.
- Common data types in PLCs.
- Role of data types in PLC programming & best practices.

Module 7: Introduction to FBD and STL PLC Programming

- What is FBD and STL?

- Key features of FBD & STL programming.
- IEC 61131-3 standard and PLC programming languages.
- Brief overview of Modbus, IO-Link, and other industrial communication protocols.
- Examples of FBD & STL.