QUEST
Professional Center

PROFESSIONAL TRAINING COURSE

Course No. 1513

PLC, HMI & SCADA Integration Training Course

INDUSTRIAL AUTOMATION & DIGITAL TECHNOLOGIES
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION
5 Days

DELIVERY
Classroom

Course Overview

The PLC, HMI & SCADA Integration Training Course provides a comprehensive and practical framework for understanding how Programmable Logic Controllers, Human-Machine Interfaces, and Supervisory Control and Data Acquisition systems work together within modern industrial automation environments. The course focuses on the integration of control, visualization, data acquisition, communication, and operator interaction to create reliable and efficient automated processes.

The program examines the architecture and functions of PLC, HMI, and SCADA systems, including controllers, input and output modules, sensors, actuators, communication networks, operator interfaces, SCADA servers, industrial databases, alarms, events, and process visualization. Participants will develop a clear understanding of how field devices communicate with PLCs, how HMIs interact with control systems, and how SCADA platforms collect and present operational information.

A strong practical emphasis is placed on system integration, industrial communication, data exchange, control logic, visualization, alarm management, and real-time monitoring. Participants will explore how to establish reliable communication between PLCs, HMIs, SCADA platforms, field instruments, and industrial networks while maintaining data integrity, operational visibility, and effective operator control.

The course also addresses troubleshooting, system diagnostics, cybersecurity, redundancy, maintenance, and performance optimization. Through practical exercises and industrial scenarios, participants will develop the ability to design an integrated PLC, HMI, and SCADA architecture, diagnose communication and control problems, improve operator interfaces, configure monitoring functions, and develop implementation strategies that support safety, reliability, productivity, and operational continuity.

Objectives

- Analyze the architecture and operating principles of PLC, HMI, and SCADA systems during the first day of the course.
- Evaluate the functions of PLC processors, input and output modules, sensors, actuators, HMIs, SCADA servers, and industrial communication networks.

- Design an integrated architecture connecting field devices, PLCs, HMIs, SCADA platforms, and industrial networks.
- Apply PLC control principles to establish reliable communication between control logic, field devices, and automated processes.
- Develop effective HMI structures for process visualization, operator control, alarms, status monitoring, and operational decision-making.
- Apply SCADA data acquisition and visualization principles to monitor industrial processes in real time.
- Evaluate industrial communication protocols and identify appropriate approaches for PLC, HMI, and SCADA integration.
- Develop systematic troubleshooting methods for communication, programming, visualization, and system integration problems.
- Assess cybersecurity, redundancy, backup, maintenance, and reliability requirements for integrated automation environments.
- Prepare an actionable PLC, HMI, and SCADA integration plan aligned with operational performance, safety, reliability, and automation objectives.

Who Should Attend

The PLC, HMI & SCADA Integration Training Course is designed for engineers, technicians, and professionals working in industrial automation, instrumentation and control, electrical engineering, process control, manufacturing, maintenance, operational technology, and industrial information systems. It is particularly relevant to PLC engineers, automation engineers, control engineers, instrumentation specialists, electrical engineers, HMI and SCADA specialists, industrial network technicians, control room personnel, and maintenance professionals involved in automated systems.

The course is also suitable for plant managers, operations managers, engineering managers, maintenance managers, automation managers, reliability professionals, control room supervisors, industrial project managers, and digital transformation specialists. It is highly relevant to executives and decision makers in government entities, ministries, public-sector organizations, oil and gas companies, energy organizations, utilities, manufacturing facilities, water and wastewater organizations, and large industrial corporations seeking to integrate control systems, improve process monitoring, strengthen automation reliability, and enhance operational performance.

Learning Outcomes

- Explain the architecture and functions of PLC, HMI, and SCADA systems and their role within industrial automation.
- Identify the relationships between field instruments, PLCs, HMIs, SCADA servers, databases, and industrial networks.
- Design a basic integrated PLC, HMI, and SCADA architecture for an industrial process.
- Apply PLC control principles to manage automated equipment and industrial processes.
- Develop HMI visualization structures for process status, control, alarms, trends, and operator interaction.
- Apply SCADA data acquisition and monitoring principles to support real-time operational visibility.
- Evaluate industrial communication protocols and determine appropriate integration approaches.
- Configure and analyze data exchange between PLCs, HMIs, SCADA systems, and field devices.
- Troubleshoot common PLC, HMI, SCADA, communication, and integration problems using structured diagnostic methods.
- Develop an integrated automation improvement plan covering system reliability, cybersecurity, maintenance, performance, and operational continuity.

Course Outline

DAY 01

PLC, HMI and SCADA Architecture Fundamentals

- Introduction to industrial automation and integrated control systems
- PLC architecture and operating principles
- PLC processors, memory, input and output modules
- Sensors, actuators, drives, and field devices
- HMI architecture and operator interaction
- SCADA architecture and major system components
- Relationship between PLC, HMI, and SCADA systems
- Industrial communication infrastructure
- Data flow from field devices to supervisory systems

DAY 01 — CONTINUED

> **PRACTICAL APPLICATION**
>
> Analyze an industrial automation architecture and identify the roles and relationships of PLC, HMI, SCADA, field devices, and networks

DAY 02

PLC Control and HMI Development

- PLC control logic and industrial applications
- Digital and analog input and output signals
- PLC programming principles
- Sequential control and process logic
- Timers, counters, interlocks, and control functions
- HMI screen design principles
- Process visualization and operator controls
- Status indicators, alarms, and control objects
- HMI trends and operational information

> **PRACTICAL APPLICATION**
>
> Develop a basic PLC control sequence and design a corresponding HMI visualization structure

DAY 03

SCADA Configuration and Industrial Communication

- Fundamentals of SCADA data acquisition
- SCADA tags, variables, and data structures
- Real-time monitoring and process visualization
- Industrial communication protocols
- PLC-to-SCADA communication
- HMI-to-PLC communication
- Data historians and historical process information

DAY 03 — CONTINUED

- SCADA alarms, events, and notifications
- Industrial network architecture and communication reliability

PRACTICAL APPLICATION

Design a communication and data acquisition structure connecting PLCs, HMIs, SCADA platforms, and industrial devices

DAY 04

System Integration, Troubleshooting and Cybersecurity

- PLC, HMI, and SCADA system integration
- Data mapping and communication configuration
- Diagnosing PLC communication problems
- Troubleshooting HMI visualization and control issues
- Troubleshooting SCADA data acquisition problems
- Network diagnostics and communication fault analysis
- System redundancy and availability
- Backup and recovery requirements
- Cybersecurity fundamentals for integrated industrial systems

PRACTICAL APPLICATION

Diagnose a simulated PLC, HMI, and SCADA integration failure and develop corrective and preventive actions

DAY 05

Optimization, Reliability and Integration Strategy

- Evaluating integrated automation system performance
- HMI usability and operator effectiveness
- SCADA visualization and monitoring optimization
- PLC program reliability and maintainability
- Alarm and event management improvement

DAY 05 — CONTINUED

- Maintenance and system lifecycle management
- Cybersecurity and access control improvement
- Performance and reliability indicators
- Developing an integrated automation roadmap

FINAL WORKSHOP

Design a complete PLC, HMI, and SCADA integration strategy covering architecture, communication, visualization, troubleshooting, cybersecurity, maintenance, and performance improvement

Register or Request More Information

Course page: https://quest-training.com/courses/plc-hmi-scada-integration-training-course
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