Training Course on Advanced Industrial Automation with PLCs and SCADA

Professional Development Training Course Outline

Category	Engineering	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Introduction

Navigate the future of manufacturing and process control with our intensive training course on Advanced Industrial Automation, focusing on Programmable Logic Controllers (PLCs) and Supervisory Control and Data Acquisition (SCADA) systems. Training Course on Advanced Industrial Automation with PLCs and SCADA is meticulously designed to provide a deep understanding of modern industrial automation technologies, emphasizing Industry 4.0 integration, cyber-physical systems, and digital transformation. Participants will gain expertise in optimizing industrial processes, enhancing operational efficiency, and ensuring robust system reliability through the mastery of advanced PLC programming, SCADA development, and Human-Machine Interface (HMI) design.

This comprehensive course empowers engineers, technicians, and automation professionals to design, implement, and maintain sophisticated automation solutions that drive productivity and innovation. We will cover cutting-edge topics such as Industrial Internet of Things (IIoT) connectivity, predictive maintenance, data analytics for process optimization, and cybersecurity in industrial control systems (ICS). Join us to elevate your skills in smart manufacturing, contributing to the development of highly efficient, interconnected, and secure industrial environments.

Programme Curriculum

Training Course on Advanced Industrial Automation with PLCs and SCADA

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Course Objectives

1. Master advanced PLC programming techniques (e.g., Structured Text, Function Block Diagram) for complex industrial applications.
2. Design and implement robust SCADA systems for comprehensive process visualization and control.
3. Integrate Industrial Internet of Things (IIoT) devices and platforms with existing automation infrastructure.
4. Develop intuitive and effective Human-Machine Interfaces (HMIs) for enhanced operator interaction and situational awareness.
5. Apply principles of cybersecurity to secure Industrial Control Systems (ICS) and prevent unauthorized access.
6. Utilize data analytics tools and techniques to optimize industrial processes and identify areas for improvement.
7. Implement predictive maintenance strategies using sensor data and machine learning concepts in an industrial context.
8. Understand and apply Industry 4.0 concepts including digital twins and smart factory integration.
9. Troubleshoot and diagnose complex faults in PLC and SCADA systems efficiently.
10. Configure and manage industrial communication protocols (e.g., OPC UA, Modbus TCP/IP, EtherNet/IP).
11. Design fail-safe and redundant automation systems for high availability and process safety.
12. Evaluate and select appropriate hardware and software components for specific industrial automation projects.
13. Contribute to the digital transformation of industrial operations through advanced automation strategies.

Organizational Benefits

1. Increased Operational Efficiency: Streamlined processes and reduced manual intervention.
2. Reduced Downtime: Proactive maintenance and rapid fault resolution.
3. Enhanced Productivity: Optimized production lines and faster cycle times.
4. Improved Data-Driven Decision Making: Actionable insights from integrated data.

5. Stronger Cybersecurity Posture: Protection against industrial cyber threats.
6. Cost Savings: Lower energy consumption and reduced waste through process optimization.
7. Competitive Advantage: Adoption of cutting-edge automation and Industry 4.0 technologies.
8. Skilled Workforce: Empowered employees capable of managing advanced automation systems.
9. Safer Operations: Automated safety interlocking and reduced human error.
10. Scalability and Flexibility: Ability to adapt production to changing demands and new technologies.

Target Participants

- Automation Engineers
- Control Systems Engineers
- PLC Programmers
- SCADA Developers and Administrators
- Maintenance Technicians
- Electrical Engineers
- Industrial IT Professionals
- Process Engineers
- Manufacturing Engineers
- Technical Managers overseeing production or automation departments.

Course Outline

Module 1: Foundations of Industrial Automation & Industry 4.0 Overview

- **Review of Basic Automation Concepts:** Control loops, sensors, actuators.
- **Introduction to Industry 4.0:** Pillars, technologies, and impact on manufacturing.
- **Cyber-Physical Systems (CPS):** Understanding the integration of physical and digital worlds.
- **Digital Transformation in Industry:** Strategies and benefits.
- **Case Study:** The journey of a traditional factory to an Industry 4.0 smart factory.

Module 2: Advanced PLC Architectures and Hardware Selection

- **High-Performance PLCs:** Modular vs. Compact PLCs, distributed I/O systems.
- **Processor Types and Memory Management:** Optimizing PLC performance.
- **Redundant PLC Systems:** Implementing hot standby and fail-over configurations.
- **Safety PLCs:** Designing and programming for safety-critical applications.
- **Case Study:** Selecting the optimal PLC architecture for a high-speed packaging line.

Module 3: Advanced PLC Programming Techniques & Standards

- **Structured Text (ST) Programming:** Complex algorithms, loops, and conditional statements.
- **Function Block Diagram (FBD) for Complex Logic:** Creating reusable logic blocks.
- **Sequential Function Chart (SFC) for Process Control:** Event-driven sequencing.
- **User-Defined Data Types (UDTs) & Function Blocks:** Modularity and reusability.

- **Case Study:** Developing a multi-mode control sequence for a batch processing plant using SFC and ST.

Module 4: Industrial Communication Protocols & Networks

- **EtherNet/IP & PROFINET:** High-speed industrial Ethernet protocols.
- **OPC UA:** Unified Architecture for secure and reliable data exchange.
- **Modbus TCP/IP & RTU:** Legacy and modern serial communication.
- **Fieldbus Technologies (e.g., DeviceNet, PROFIBUS):** Understanding their role.
- **Case Study:** Configuring communication between a PLC, an HMI, and a third-party device using OPC UA.

Module 5: SCADA System Design & Development

- **SCADA Architecture Best Practices:** Distributed and centralized systems.
- **Database Integration with SCADA:** Data logging, alarming, and historical trends.
- **Tag Management and Optimization:** Efficient data point handling.
- **Scripting in SCADA:** Enhancing functionality with VBScript or Python.
- **Case Study:** Designing a comprehensive SCADA system for a water treatment plant.

Module 6: Human-Machine Interface (HMI) Design for Usability and Effectiveness

- **Principles of Effective HMI Design:** Situational awareness, alarm management.
- **Graphical Screen Development:** Creating intuitive and informative displays.
- **Navigation and User Experience (UX):** Ensuring seamless operator interaction.
- **Alarm and Event Management:** Prioritization, notification, and acknowledgment.
- **Case Study:** Redesigning an existing HMI for improved operator efficiency and safety.

Module 7: Industrial Internet of Things (IIoT) Integration

- **IIoT Gateways and Platforms:** Connecting operational technology (OT) to IT.
- **Sensor Data Acquisition and Cloud Connectivity:** Leveraging cloud services for industrial data.
- **MQTT and AMQP for IIoT Messaging:** Lightweight protocols for data exchange.
- **Edge Computing in Industrial Environments:** Processing data closer to the source.
- **Case Study:** Connecting a legacy machine to an IIoT platform for real-time monitoring.

Module 8: Data Analytics for Process Optimization

- **Collecting and Storing Industrial Data:** Historians and time-series databases.
- **Basic Statistical Process Control (SPC):** Identifying process variations.
- **Data Visualization and Reporting:** Presenting insights effectively.
- **Introduction to Machine Learning for Process Optimization:** Anomaly detection, quality prediction.
- **Case Study:** Using historical SCADA data to identify inefficiencies in a continuous production process.

Module 9: Predictive Maintenance Strategies

- **Condition Monitoring Techniques:** Vibration analysis, temperature monitoring.
- **Sensor Deployment for Predictive Maintenance:** Strategic placement and data collection.
- **Machine Learning Models for Anomaly Detection:** Identifying potential equipment failures.
- **Integration with Enterprise Asset Management (EAM) Systems:** Automating work orders.

- **Case Study:** Implementing a predictive maintenance system for a critical motor in a factory.

Module 10: Cybersecurity for Industrial Control Systems (ICS)

- **Threat Landscape in ICS:** Common attack vectors and vulnerabilities.
- **IEC 62443 Standard:** Framework for industrial cybersecurity.
- **Network Segmentation and Firewalls:** Protecting critical assets.
- **Secure Remote Access and Authentication:** Best practices for remote operations.
- **Case Study:** Developing a cybersecurity mitigation plan for an existing SCADA system.

Module 11: Digital Twins and Simulation in Industrial Automation

- **Concept of Digital Twins:** Virtual representation of physical assets and processes.
- **Benefits of Digital Twins:** Design optimization, predictive analysis, training.
- **Simulation Software for Industrial Processes:** Testing control logic and system behavior.
- **Connecting Digital Twins to Live Data:** Real-time synchronization.
- **Case Study:** Creating a digital twin of a robotic assembly cell to optimize its movements.

Module 12: Advanced Control Strategies & Optimization

- **PID Control Tuning and Optimization:** Advanced techniques for stable control.
- **Model Predictive Control (MPC) Concepts:** Anticipating future process behavior.
- **Fuzzy Logic Control:** Handling imprecise and uncertain data.
- **Recipe Management and Batch Control:** Automating complex production sequences.
- **Case Study:** Optimizing a temperature control loop in a chemical reactor using advanced PID tuning.

Module 13: Alarm Management and High-Performance HMI (HPHMI)

- **Alarm Philosophy and Rationalization:** Reducing alarm floods.
- **ISA 18.2 Standard for Alarm Management:** Best practices and guidelines.
- **Designing for High-Performance HMI:** Contextual information, minimal clutter.
- **Operator Training and Response to Alarms:** Effective human interaction with automation.
- **Case Study:** Revamping an existing alarm system to comply with industry standards and improve operator response.

Module 14: Project Management & Commissioning of Automation Systems

- **Phases of an Automation Project:** From design to deployment.
- **FAT (Factory Acceptance Test) & SAT (Site Acceptance Test):** Ensuring system functionality.
- **Documentation Best Practices:** Wiring diagrams, program comments, manuals.
- **Troubleshooting Methodologies:**Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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