

PLC, SCADA and DCS Systems Engineering Training Course

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Overview

The PLC, SCADA and DCS Systems Engineering Training Course is a one-week course for automation engineers, instrumentation specialists, and control room supervisors who leave with an industrial control architecture blueprint and commissioning matrix. Modern facilities confront system integration bottlenecks, legacy protocol mismatches, and operational technology cybersecurity risks that cause unscheduled downtime and process safety events. This course resolves these challenges through structured control logic design, multi-node telemetry mapping, redundant controller configuration, and industrial network defense. Agile Leaders Training Center delivers the PLC, SCADA and DCS Systems Engineering Training Course.

Who Should Attend

- Automation engineers responsible for programming programmable logic controllers and configuring distributed control loops.
- Instrumentation specialists tasked with calibrating field transmitters, configuring remote terminal units, and verifying input-output loops.
- Control system integrators designing supervisory control interfaces, telemetry protocols, and historian architectures.
- Plant electrical supervisors overseeing switchgear automation, motor control centers, and uninterrupted power reliability.
- Operational technology engineers managing industrial network segmentation, firewall rules, and field device cyber defenses.

The course assumes participants actively work with industrial control hardware and digital logic diagrams, leaving out elementary electrical circuitry and basic physics.

Departments and Industries

The course draws practical technical operational scenarios from continuous processing, manufacturing, and critical infrastructure sectors.

- Petrochemical refining and midstream oil processing plants
- Continuous batch pharmaceutical and chemical production facilities
- Municipal water treatment, desalination, and distribution networks
- Thermal power generation, grid transmission, and substation facilities
- Industrial process automation and field engineering divisions
- Plant maintenance, reliability engineering, and technical safety departments

Learning Objectives

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

- Apply IEC 61131-3:2025 standard programming languages to build structured control logic for complex processes.
- Configure supervisory visualization screens, dynamic trend graphics, and alarm management matrices in SCADA platforms.
- Analyze distributed control architectures to deploy redundant processors, remote input-output drops, and fieldbus segments.
- Evaluate industrial network traffic across Modbus TCP, OPC UA, and DNP3 communication protocols.
- Prioritize operational technology defense controls in accordance with ISA/IEC 62443 security levels.
- Build a complete industrial control architecture blueprint and commissioning matrix for facility deployment.

Course Agenda

Day 1: Controller Hardware Architectures and IEC 61131-3:2025 Programming

- Processor rack configurations, power supply sizing, and isolated digital or analog input-output channel wiring
- Signal conditioning, analog-to-digital resolution scaling, thermocouple integration, and 4-20 milliamp loop verification
- Structured Text syntax, Ladder Diagram rungs, and Function Block Diagram organization under IEC 61131-3:2025
- Software organization units, user-defined data structures, and standard function libraries compliant with PLCopen specifications
- Program scan cycles, task scheduling priorities, watchdog timer allocations, and fault interrupt routines

Day 2: Distributed Control System Engineering and Continuous Process Loops

- DCS system topology, controller redundancy synchronization, and remote input-output cabinet distribution
- Proportional-integral-derivative algorithm execution, loop tuning rules, and cascade control configuration
- Fail-safe logic states, hardware interlock circuits, and voting logic design for critical safety equipment
- Subsystem integration methods connecting third-party packages to central DCS nodes via fieldbus networks
- Historian data collection architectures, deadband logging rules, and long-term trend database sizing

Day 3: SCADA Visualization, Telemetry, and Industrial Network Protocols

- SCADA server-client infrastructure design, human-machine interface graphic creation, and multi-monitor console layout
- ISA-18.2 alarm management rationalization, priority tiering, suppression logic, and alarm flood prevention
- Modbus RTU and Modbus TCP mapping, memory register allocation, and serial-to-Ethernet gateway setup
- OPC Unified Architecture information modeling, secure server certificates, and node endpoint publishing
- Telemetry protocols for wide-area networks, RTU polling cycles, and DNP3 timestamped event buffer management

Day 4: OT Network Infrastructure, ISA/IEC 62443 Defense, and High Availability

- Purdue model network hierarchy, industrial managed switch configuration, and VLAN segmentation schemes
- ISA/IEC 62443 security levels, zone and conduit segregation, and operational technology firewall packet inspection
- Ring topology protocols, spanning tree configuration, and dual-homed media redundancy for uninterrupted uptime
- Remote access architectures, jump server isolation, multi-factor credential policies, and diagnostic port shielding
- Asset inventory tracking, controller firmware baseline auditing, and operational system backup routines

Day 5: Systems Integration Testing, Commissioning, and Capstone Assembly

- Suggested activity: Diagnose controller input-output communication dropouts and address resolution faults across Ethernet networks
- Suggested activity: Evaluate proportional-integral-derivative response data to stabilize oscillating pressure and flow loops
- Suggested activity: Audit supervisory alarm trip logs to identify nuisance alarms and stale process variables
- Suggested activity: Configure industrial firewall rule sets to isolate supervisory control networks from enterprise traffic
- Capstone exercise: Assemble an integrated industrial control architecture blueprint and commissioning matrix for plant operations

Practical Exercises

The course uses engineering design software templates, simulated controller logs, and industrial telemetry packet traces.

- Suggested activity: Program a multi-state motor control logic sequence using Structured Text and Function Block Diagrams.
- Suggested activity: Build an OPC UA client-server tag database connecting distributed controllers to a central SCADA node.
- Suggested activity: Configure an ISA/IEC 62443 network zone boundary using managed switch VLANs and firewall rules.
- Suggested activity: Conduct a simulated loop check and complete input-output cold and hot commissioning sign-off sheets.

FAQs

Who suits the PLC, SCADA and DCS Systems Engineering Training Course?

The PLC, SCADA and DCS Systems Engineering Training Course suits automation, instrumentation, and control systems engineers. The course assumes participants actively manage industrial input-output hardware, read digital schematics, and configure basic control software, leaving out fundamental circuit theory and introductory schoolhouse physics.

How does this course differ from basic PLC wiring courses?

Basic wiring courses focus strictly on physical termination and discrete relay logic. The PLC, SCADA and DCS Systems Engineering Training Course integrates plant-scale distributed control system engineering, supervisory visualization, multi-protocol telemetry integration, and ISA/IEC 62443 operational technology cybersecurity segmentation.

What programming languages does the course utilize?

The course utilizes programming languages defined under IEC 61131-3:2025. Practical engineering exercises center on Structured Text, Function Block Diagrams, and Ladder Diagrams, applying modular program organization units aligned with modern PLCopen standardized software specifications.

How are industrial communication protocols addressed during system integration?

System integration addresses communication protocols by mapping registers and configuring data points across Modbus TCP, DNP3, and OPC Unified Architecture. Participants evaluate network packet exchanges to establish dependable, timestamped telemetry between field controllers, supervisory SCADA consoles, and enterprise historians.

Conclusion

Participants return to their facilities equipped with a verified industrial control architecture blueprint and commissioning matrix. This integrated technical package provides plant operators with validated logic routines, streamlined telemetry mappings, and standardized alarm configurations. Implementing these engineering deliverables improves overall plant stability, accelerates loop commissioning, and strengthens operational resilience across all industrial control networks.

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