

Course No. 1510

Industrial Instrumentation & Control Training Course

INDUSTRIAL AUTOMATION & DIGITAL TECHNOLOGIES
INDUSTRIAL ENGINEERING, MAINTENANCE & OPERATIONS

DURATION

5 Days

DELIVERY

Classroom



Course Overview

The Industrial Instrumentation & Control Training Course provides a comprehensive and practical framework for understanding, operating, maintaining, and optimizing instrumentation and control systems used across modern industrial facilities. The course focuses on the measurement and control of critical process variables such as pressure, temperature, flow, level, speed, and composition, enabling participants to understand how accurate instrumentation supports safe, reliable, efficient, and consistent operations.

The program covers the fundamental principles of industrial measurement, including sensors, transmitters, switches, control valves, actuators, signal conditioning, process controllers, and industrial communication systems. Participants will develop a clear understanding of how field instruments interact with control systems and how measurement accuracy, calibration, signal quality, and control performance influence overall plant operations.

A strong practical emphasis is placed on process control and automation. Participants will examine control loops, feedback and feedforward control, proportional-integral-derivative control, process dynamics, control valve operation, alarm management, and distributed control environments. The course also addresses programmable logic controllers, supervisory control systems, industrial networks, and the integration of instrumentation with wider operational technology environments.

The course further develops practical capabilities in calibration, troubleshooting, preventive maintenance, instrument selection, control loop performance assessment, and system reliability. Through industrial case studies, practical exercises, fault analysis, and application workshops, participants will learn how to identify instrumentation and control problems, evaluate their operational impact, and develop effective solutions that support safety, productivity, asset reliability, and operational continuity.

Objectives

- Analyze the fundamental principles of industrial instrumentation and process measurement during the first day of the course.
- Evaluate the characteristics and applications of pressure, temperature, flow, level, and other industrial measurement instruments.

- Apply appropriate principles for selecting sensors, transmitters, switches, actuators, and control valves for industrial applications.
- Develop practical approaches to instrument calibration, verification, signal testing, and measurement accuracy.
- Analyze industrial control loops and evaluate the interaction between field instruments, controllers, actuators, and process equipment.
- Apply proportional-integral-derivative control principles to improve process stability, accuracy, and response.
- Evaluate control valve performance, sizing considerations, positioning, and common operational problems.
- Assess programmable control, supervisory control, distributed control, and industrial communication technologies used in automated facilities.
- Develop systematic troubleshooting and preventive maintenance approaches for instrumentation and control systems.
- Prepare an actionable improvement plan for instrumentation reliability, control performance, maintenance effectiveness, and operational safety.

Who Should Attend

The Industrial Instrumentation & Control Training Course is designed for engineers, technicians, and professionals working in instrumentation, process control, automation, electrical and mechanical engineering, operations, maintenance, reliability, and industrial systems. It is particularly relevant to instrumentation and control engineers, automation engineers, process control engineers, electrical engineers, maintenance engineers, control technicians, instrumentation technicians, and industrial systems specialists.

The course is also suitable for plant managers, operations managers, maintenance managers, engineering managers, reliability professionals, process engineers, production supervisors, control room personnel, and industrial project managers. It is highly relevant to executives and decision makers in government entities, ministries, public-sector organizations, oil and gas companies, petrochemical facilities, energy organizations, utilities, manufacturing companies, water and wastewater facilities, and large industrial organizations seeking to improve process measurement, automation, control performance, equipment reliability, safety, and operational efficiency.

Learning Outcomes

- Explain the principles and applications of industrial instrumentation and process measurement.
- Identify appropriate instruments for measuring pressure, temperature, flow, level, and other critical process variables.
- Evaluate sensor, transmitter, switch, actuator, and control valve characteristics for specific industrial applications.
- Apply calibration and verification techniques to improve measurement accuracy and instrument reliability.
- Analyze process control loops and identify relationships between measurement, control, and final control elements.
- Apply proportional-integral-derivative control concepts to improve process stability and control performance.
- Evaluate control valve operation, common failure modes, and performance considerations.
- Explain the functions and applications of programmable logic controllers, supervisory control systems, and distributed control systems.
- Troubleshoot common instrumentation and control system problems using structured diagnostic methods.
- Develop preventive maintenance and reliability improvement measures for industrial instrumentation and control systems.

Course Outline

DAY 01

Industrial Instrumentation and Process Measurement Fundamentals

- Introduction to industrial instrumentation and process control
- Industrial measurement principles and measurement terminology
- Pressure measurement instruments and applications
- Temperature sensors and measurement technologies
- Flow measurement principles and flowmeter technologies
- Level measurement instruments and applications
- Process measurement accuracy, repeatability, and reliability

DAY 01 — CONTINUED

- Sensors, transmitters, switches, and signal conditioning
- Instrument selection and application considerations

PRACTICAL APPLICATION

Selecting appropriate instruments for a process measurement scenario and evaluating measurement requirements

DAY 02

Instrument Calibration, Control Valves and Final Control Elements

- Fundamentals of industrial instrument calibration
- Calibration procedures and calibration documentation
- Measurement errors, uncertainty, and instrument verification
- Signal testing and instrument loop verification
- Control valves and their role in process control
- Valve types, actuators, positioners, and accessories
- Control valve sizing and selection considerations
- Common control valve problems and failure modes
- Preventive maintenance for field instrumentation

PRACTICAL APPLICATION

Developing a calibration and verification procedure for selected industrial instruments and analyzing control valve performance

DAY 03

Process Control and Control Loop Optimization

- Fundamentals of process control
- Open-loop and closed-loop control
- Feedback and feedforward control
- Process dynamics and response characteristics

DAY 03 — CONTINUED

- Proportional, integral, and derivative control
- Controller tuning principles
- Control loop stability and performance
- Cascade and advanced control strategies
- Alarm management and abnormal process conditions

PRACTICAL APPLICATION

Analyzing a process control loop, identifying performance issues, and developing appropriate tuning and improvement actions

DAY 04

Industrial Automation, Control Systems and Communication

- Programmable Logic Controllers and industrial automation
- Supervisory control and data acquisition systems
- Distributed control systems
- Human-machine interfaces and operator interaction
- Industrial communication networks and protocols
- Integration of field instrumentation with control systems
- Industrial data acquisition and process monitoring
- Control system reliability and availability
- Cybersecurity considerations for industrial control environments

PRACTICAL APPLICATION

Designing an instrumentation and control architecture for a selected industrial process

DAY 05

Troubleshooting, Reliability and Performance Improvement

- Systematic troubleshooting of instrumentation problems
- Diagnostic methods for control loops and field devices

DAY 05 — CONTINUED

- Identifying measurement and signal faults
- Troubleshooting control valve and actuator problems
- Preventive and predictive maintenance strategies
- Instrument reliability and criticality assessment
- Root cause analysis of recurring instrumentation failures
- Key performance indicators for instrumentation and control systems
- Developing an instrumentation and control improvement strategy

FINAL WORKSHOP

Developing an integrated reliability and performance improvement plan for an industrial instrumentation and control system

Register or Request More Information

Course page: <https://quest-training.com/courses/industrial-instrumentation-control-training-course>

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