



The Instrumentation and Control Series consists of 5 core subject areas necessary to achieve the requisite competency for further specialization.

Introduction to Instrumentation and Control

Industrial Instrumentation and Control Overview

- The Basic Instrument Channel
- Closed-Loop Instrument Channels
- Instrument Loops

Principle of Measurement

- Static Characteristics
- Measurement Uncertainty
- Dynamic Characteristics and Response

Industry Signal Standards

- Analog Signal Standards
- HART Communications Protocol
- Fieldbus Standards

Process Measurement

Pressure Measurement

- Pressure Measurement
- Units of Pressure
- Unit Conversion
- Dead Weight Testers
- Pressure Sensor Positioning

Level Measurement

- Direct Measurements
- Indirect Measurements

Introduction to Flow Measurement

- Flow Measurement
- Fluid Properties
- Flow Meter Classifications
- Flow Measurement Systems

Head Flow Meters

- Introduction to Head Flow Meters
- Venturi Tubes and Similar Devices
- Pitot Tubes
- Other Pressure-Related Flow Meters

Linear and Mass Flow

- Positive-Displacement Meters
- Velocity Flow Meters
- Mass Flow Meters

Temperature Measurement I

- Temperature Scales and Conversion
- Fundamentals of Temperature Measurement
- Factors Affecting Temperature Measurement

Temperature Measurement II

- Thermocouples
- Resistance Temperature Detectors
- Other Types of Temperature Measurement Devices

Process Controls and Monitoring

Process Control Fundamentals

- Control Loops and Types of Processes
- Terminology
- Feedback

Two-Position and Proportional Control

- Two-Position Control
- Proportional Control
- Flow Coefficient

Integral, Derivative, and PID Control

- Proportional and Integral Control
- Proportional and Derivative Control
- Proportional, Integral, and Derivative Control

Loop Tuning

- Loop Tuning Criteria
- Closed Loop Tuning Methods

Advanced Control Methods

- Feedforward Control
- Cascade Control
- Ratio Control
- Three Element Control

Introduction to Actuators

- Purpose of a Valve Actuator
- Types of Actuators
- Closed Loop Systems

Actuators Principles of Operation

- Pneumatic Actuator Principles of Operation
- Electric Actuator Principles of Operation
- Hydraulic Actuator Principles of Operation

Control Valves I

- Purpose of Valves
- Valve Components
- Valve Mounting Methods

Control Valves II

- Gate Valves
- Globe Valves
- Needle Valves
- Butterfly Valves

Control Valves III

- Ball Valves
- Plug Valves
- Check Valves
- Regulating Valves

Control System Architecture

- PLCs
- DCS
- SCADA

PLC

PLC Overview

- PLC Components
- Basic Operation
- Scan Cycle
- Ladder Logic

PLC Communications

- Communications Terminology
- Networks and Protocols
- Common PLC Communication Configurations

PLC Software

- Software
- HMI
- Instructions

PLC Hardware

- Power Supplies
- Processors
- Input/Output Modules

PLC Addressing

- Number Systems
- Terminology
- Rack Addressing

Process Analyzers

Introduction to Process Analyzers

- Process Analyzers
- Analyzer Systems

Gas Chromatography I

- History of Chromatography
- Basic Theory of Gas Chromatography
- Natural Gas Applications

Gas Chromatography II

- Gas Chromatography Principle Elements
- Main Factors Affecting Analysis
- Operation Cycle

Hydrogen Sulfide and Oxygen Analyzers

- Hydrogen Sulfide Analyzers
- Oxygen Analyzers

Moisture Analyzers

- Moisture Content Measuring Instruments
- Optical Chilled Mirror Hygrometers