



Device Selection



Abu Dhabi Centre for
Technical and Vocational
Education and Training

GMI INNOVATION INSTITUTE®
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Registered
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for Health and Occupational Safety
and the Environment

EFQM
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Course Introduction:

This course provides participants with an in-depth understanding of instrumentation device selection and application, a key aspect in ensuring the accuracy, efficiency, and reliability of measurement and control systems in various industries. The course will cover fundamental concepts, device technologies, and best practices for selecting the appropriate instruments based on operational requirements, environmental conditions, and performance specifications. By the end of the course, participants will be able to make informed decisions regarding the selection and application of instruments, ensuring optimal system performance and compliance with industry standards.

Throughout the course, participants will explore the core principles of instrumentation systems, including sensor types, signal conditioning, calibration, and integration into process control systems. Topics such as pressure, temperature, flow, level, and analytical measurements will be discussed in detail, along with the selection criteria for each. Emphasis will also be placed on understanding the influence of industry-specific requirements such as accuracy, range, response time, and environmental factors in device selection. This theoretical framework will enable professionals to better align instrumentation technologies with operational needs while maintaining cost-efficiency and reliability.

Course Objectives:

By the end of the training, participants will be able to:

- Gain a comprehensive understanding of instrumentation devices and their applications across different industries.
- Learn the selection criteria for various types of instrumentation devices.
- Understand the role of sensors, transmitters, and actuators in process measurement and control systems.
- Explore the principles of measurement for pressure, temperature, flow, level, and analytical parameters.
- Understand the factors influencing device selection, such as accuracy, response time, and environmental considerations.

- Develop an understanding of the integration of instrumentation devices into control systems.
- Learn about calibration and maintenance requirements for accurate and reliable performance.
- Explore the application of instrumentation devices in industry-specific contexts (e.g., oil and gas, pharmaceuticals, power generation).
- Recognize the importance of standards, certifications, and regulations in the selection of instrumentation devices.

Who Should Attend?

This course is designed for all:

- Legal professionals and contract managers
- Business executives and international trade specialists
- Compliance officers and risk management professionals
- Professionals involved in cross-border transactions

Course Outline:

Day 1: Introduction to Instrumentation Systems and Device Selection

- Overview of Instrumentation in Industry
 - Importance of instrumentation in industrial automation and control
 - Key components of instrumentation systems: Sensors, transmitters, actuators, and controllers
 - Role of instrumentation in process control, monitoring, and safety
- Fundamental Principles of Measurement and Control
 - Basic measurement principles: Accuracy, precision, range, and resolution
 - Signal types: Analog, digital, and pneumatic signals
 - Understanding control loops and feedback systems
- Factors Influencing Instrument Selection
 - Application-specific requirements: Range, accuracy, response time
 - Environmental considerations: Temperature, pressure, humidity, corrosive environments
 - Cost and performance trade-offs in selecting instrumentation devices

Day 2: Pressure, Temperature, and Flow Measurement Devices

- Pressure Measurement Devices
 - Types of pressure sensors: Strain gauges, capacitive, piezoelectric, and optical pressure sensors
 - Selection criteria: Pressure range, accuracy, and materials compatibility
 - Application in industries: Oil and gas, chemical, and power generation
- Temperature Measurement Devices
 - Common temperature sensors: RTDs, thermocouples, thermistors, and infrared sensors
 - Selection criteria: Temperature range, accuracy, response time, and stability
 - Temperature measurement applications in industries like pharmaceuticals, food processing, and energy
- Flow Measurement Devices
 - Types of flow meters: Differential pressure, magnetic, turbine, and ultrasonic flow meters
 - Key selection factors: Flow range, fluid properties, pressure drop, and accuracy
 - Industry applications: Water treatment, oil and gas, and chemical processing

Day 3: Level and Analytical Measurement Devices

- Level Measurement Devices
 - Types of level sensors: Float, capacitive, radar, ultrasonic, and laser sensors
 - Selection factors: Accuracy, sensitivity to material properties, and installation environment
 - Application areas: Tank level monitoring in oil and gas, chemicals, and water treatment
- Analytical Measurement Devices
 - Common analytical instruments: pH, conductivity, dissolved oxygen, turbidity, and gas analyzers
 - Selection criteria for analytical instruments: Sensitivity, calibration, and range
 - Applications in industries such as pharmaceuticals, wastewater treatment, and environmental monitoring
- Challenges in Level and Analytical Measurements
 - Addressing environmental impacts: Foam, dust, temperature variations
 - Application-specific challenges and selection considerations

Day 4: Integration, Calibration, and Maintenance of Instrumentation Devices

- Device Integration into Control Systems

- Overview of system integration: Communication protocols (e.g., HART, Modbus, Fieldbus)
- Role of transmitters and controllers in data acquisition and control loops
- Selecting devices based on integration compatibility with control systems
- Calibration of Instrumentation Devices
 - Importance of calibration in ensuring measurement accuracy
 - Calibration methods: Manual, automated, and in-situ calibration techniques
 - Frequency of calibration and documentation standards
- Maintenance of Instrumentation Devices
 - Preventative and corrective maintenance strategies
 - Common issues and troubleshooting techniques for instrumentation systems
 - Maintaining accuracy and reliability over the device's lifecycle

Day 5: Industry-Specific Applications and Standards in Instrumentation

- Instrumentation in Specific Industries
 - Oil and Gas: Harsh environments, high-pressure applications, and hazardous conditions
 - Power Generation: Monitoring turbines, reactors, and environmental emissions
 - Pharmaceuticals: Sterility, accuracy, and compliance with regulations (e.g., FDA, GMP)
- Instrumentation Standards and Certifications
 - Relevant standards: IEC, ANSI, ISO, ATEX (explosion-proof devices), and safety certifications
 - Understanding the regulatory landscape for instrumentation devices
 - Impact of industry standards on device selection, installation, and operation
- Trends and Innovations in Instrumentation
 - Digitalization and Industry 4.0: Integration with IoT, smart devices, and predictive analytics
 - Emerging technologies: Wireless sensors, advanced materials, and nanotechnology
 - The future of instrumentation in automation, monitoring, and control systems

Course Methodology:

A variety of methodologies will be used during the course that including:

- (30%) Based on Case Studies
- (30%) Techniques
- (30%) Role Play
- (10%) Concepts
- Pre-test and Post-test

- Variety of Learning Methods
- Lectures
- Case Studies and Self Questionnaires
- Group Work
- Discussion
- Presentation

Course Certificate:

International Center for Training & Development (ICTD) will award an internationally recognized certificate(s) for each delegate on completion of training.

Course Fees:

To be advised as per course location. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Timings:

Daily Course Timings:

08:00 - 08:20	Morning Coffee / Tea
08:20 - 10:00	First Session
10:00 - 10:20	Coffee / Tea / Snacks
10:20 - 12:20	Second Session
12:20 - 13:30	Lunch Break & Prayer Break
13:30 - 15:00	Last Session