



- **Instrumentation – 3 day theory + practical with Day 4A for Water/Wastewater, 4B for Oil/Gas**

Split: 2 Days Theory | 2 Days Practical

Audience: Technicians, engineers, and instrumentation professionals

Focus: Core principles, industrial applications, and hands-on calibration, wiring, and diagnostics

Instrumentation Training Course – 4-Day Intensive Program

A professionally engineered training experience designed for instrumentation technicians, engineers, and operations personnel. This course delivers a balanced blend of theory, hands-on practice, and sector-specific commissioning, aligned with ISA/IEC standards and real-world industrial demands.

◇ Day 1 – Foundations of Instrumentation (Theory)

Participants build a strong theoretical base in instrumentation principles, signal types, and documentation standards.

- ISA/IEC standards, safety protocols, and approvals
- Process variables: pressure, temperature, flow, level
- Signal types: analog vs digital, 4–20 mA, HART, Fieldbus
- Sensor fundamentals: RTDs, thermocouples, strain gauges
- Transmitters, PID control basics, and tuning overview
- Loop architecture: P&IDs, loop diagrams, shielding, grounding
- Intro to analytical instrumentation: pH, conductivity, turbidity

◇ Day 2 – Systems, Safety & Analytics (Theory)

Focus shifts to control systems, hazardous area compliance, and analytical instrumentation integration.

- PLCs, DCS, SCADA overview and I/O mapping
- Signal conditioning, isolation, and lifecycle planning
- Hazardous area instrumentation: zoning, certification
- Analytical instrumentation: pH, DO, ORP, gas detection, spectroscopy
- Integration protocols: MODBUS, Ethernet/IP, cybersecurity
- Maintenance planning, calibration schedules, and asset reliability

◇ Day 3 – Practical Fundamentals & Core Measurements

Participants engage in hands-on activities to reinforce wiring, calibration, and fault diagnostics.

Morning Session

- Sensor wiring: RTDs, thermocouples, pressure transmitters
- HART communicator workshop: ranging, diagnostics, zero/span
- Loop check: continuity testing, fault isolation
- Sample conditioning systems and troubleshooting

Afternoon Session

- Hands-on inspection and simulation of flow, level, and temperature instruments
- Simulating faults: open loops, reversed polarity, drift
- Live diagnostics using field displays and communicators
- Documentation of inspection findings and corrective actions

◇ Day 4 – Sector-Specific Tracks

Option A: Oil & Gas Focus

Tailored for upstream, midstream, and refining environments.

Morning Session

- Analytical instrumentation: GC, IR/UV spectroscopy, H₂S, sulfur
- Emissions monitoring: CEMS, FID, NO_x/SO_x stack analyzers
- Custody transfer: density, viscosity, water cut analyzers
- Calibration traceability and API compliance

Afternoon Session

- Classified area instrumentation & controls
 - Protection techniques: intrinsic safety, flameproof, pressurized systems
- Functional safety overview
 - SIL principles: risk reduction, voting logic (1oo2, 2oo3), diagnostics
- Participant-led commissioning and wrap-up

Option B: Water/Wastewater Focus

Designed for municipal, industrial, and environmental applications.

Morning Session

- Flow & level instrumentation: magnetic, ultrasonic, hydrostatic, radar
- Analytical instrumentation: pH, resistivity, DO, turbidity, TDS
- Calibration techniques and temperature compensation

Afternoon Session

- Water quality analyzers: ammonia, chlorine, TOC
- Maintenance & cleaning: fouling, scaling, biofilm removal
- Fault simulation: pump/lift station diagnostics
- Participant-led commissioning and QA/QC wrap-up