MERCURY

# Electrical and Instrumentation Professional Development

Dubai - UAE: +971 4 450 5697
Istanbul - Türkiye: +90 539 599 1206
Amman - Jordan: +962 79 712 3347

MERCURY

# Electrical and Instrumentation Professional Development

## Introduction:

The Electrical and Instrumentation Professional Development course enhances the technical capabilities of professionals working in modern industrial environments. It offers in-depth knowledge and hands-on approaches in electrical systems, instrumentation, automation, and control strategies. Participants will explore industry standards, calibration procedures, maintenance techniques, and diagnostics in both electrical and instrumentation fields.

This Electrical and Instrumentation Professional Development training emphasizes the integration of systems in process industries to ensure optimal performance, reliability, and safety. Through practical modules, the course enhances competencies in troubleshooting, interpreting diagrams, and applying instrumentation principles to real-life scenarios.

Learners will be well-versed in both theoretical frameworks and operational procedures. This Electrical and Instrumentation Professional Development program aligns with career development goals in sectors such as oil & gas, energy, petrochemical, manufacturing, and utilities.

## Targeted Groups:

This Electrical and Instrumentation Professional Development training targets professionals seeking specialized knowledge and skills:

- Electrical engineers aim to enhance field application techniques.
- Instrumentation engineers work in process automation.
- Maintenance technicians are involved in electrical systems.
- Industrial electricians require advanced troubleshooting capabilities.
- Control system operators seeking to deepen their understanding of instrumentation.
- Project engineers manage E&I installations.
- Automation specialists in the manufacturing or oil and gas sectors.
- Engineering supervisors are responsible for safety and diagnostics.
- Plant managers are aiming to boost equipment reliability.
- Recent graduates in electrical or instrumentation disciplines.

## Targeted Competencies:

Participants will gain the following competencies during the Electrical and Instrumentation Professional Development program:

- Proficiency in interpreting electrical and instrumentation schematics.
- Ability to conduct preventive and corrective maintenance.
- Skill in calibrating process instruments accurately.
- Understanding of system integration and automation controls.
- Competence in applying electrical safety practices.
- Effective troubleshooting of electrical and control circuits.
- Knowledge of instrumentation selection and configuration.
- Reporting and documentation of system performance data.

Dubai - UAE: +971 4 450 5697
Istanbul - Türkiye: +90 539 599 1206
Amman - Jordan: +962 79 712 3347

MERCURY

## Course Objectives:

Participants will achieve the following objectives by completing the Electrical and Instrumentation Professional Development course:

- Understand the core functions of electrical and instrumentation systems.
- Identify the key components and design features of industrial automation systems.
- Apply safety standards in electrical maintenance and calibration.
- Analyze schematics and wiring diagrams effectively.
- Calibrate instrumentation for pressure, temperature, and flow systems.
- Troubleshoot common faults in instrumentation loops and electrical panels.
- Interpret control system logic and PLC operations.
- Select suitable instrumentation for different industrial applications.
- Monitor and evaluate system performance to reduce downtime.
- Integrate instrumentation systems with SCADA and DCS.
- Execute maintenance schedules based on predictive diagnostics.
- Use measurement tools accurately and safely.
- Document findings and prepare compliance reports.
- Coordinate with teams for optimized project execution.

## Course Content:

### Unit 1: Fundamentals of Electrical and Instrumentation Systems:

- Introduction to electrical components: relays, contactors, and MCCs.
- Basics of voltage, current, resistance, and power.
- Overview of instrumentation: transmitters, sensors, and actuators.
- Differences between analog and digital instrumentation.
- Loop diagrams and signal path analysis.
- Electrical wiring practices and cable management.
- Understanding grounding and earthing systems.
- Instrumentation communication protocols HART, Foundation Fieldbus.
- Safety protocols in E&I systems.

### Unit 2: Electrical Systems in Industrial Applications:

- Operation and maintenance of low- and medium-voltage equipment.
- Transformer theory and industrial applications.
- Motor control and variable frequency drives VFDs.
- Circuit protection devices: fuses, breakers, and overload relays.
- Power distribution networks and load analysis.
- Emergency power systems and UPS setup.
- Power quality analysis and harmonic filtering.
- Lockout/Tagout LOTO Procedures in Electrical Maintenance.
- Standards and codes: IEC, NEC, IEEE.

Dubai - UAE: +971 4 450 5697
Istanbul - Türkiye: +90 539 599 1206
Amman - Jordan: +962 79 712 3347

MERCURY

### Unit 3: Instrumentation Calibration and Configuration:

- Calibration fundamentals and reference standards.
- Pressure, temperature, flow, and level instrumentation.
- Use of calibrators and loop testers.
- Zero-span calibration techniques.
- Configuring smart transmitters using handheld devices.
- Interpreting P&ID and loop drawings.
- Documentation and traceability of calibration data.
- Common calibration errors and how to avoid them.
- Maintenance strategies for long-term accuracy.

### Unit 4: Control Systems and Automation Integration:

- Introduction to PLCs, SCADA, and DCS.
- Signal flow from field instruments to control rooms.
- Basics of ladder logic and function block diagrams.
- Human-Machine Interface HMI concepts.
- PID control theory and tuning basics.
- Integration of E&I systems for automated processes.
- Ethernet/IP and Modbus communication.
- Alarm and event management in SCADA.
- Cybersecurity considerations in control networks.

### Unit 5: Troubleshooting, Maintenance, and Diagnostics:

- Structured troubleshooting methodologies.
- Diagnosing electrical faults in control panels.
- Instrumentation loop fault analysis.
- Use of multimeters, megohmmeters, and thermal cameras.
- Vibration analysis and predictive maintenance tools.
- Case studies in plant shutdown due to E&I faults.
- Maintenance planning and CMMS utilization.
- Risk Assessment and Failure Modes FMEA.
- Root cause analysis and reporting.

## Final Insights & Key Takeaways:

This Electrical and Instrumentation Professional Development course provides a strong foundation in both electrical and instrumentation systems for professionals in technical environments. Participants will be equipped with real-world skills to ensure operational efficiency, safety, and reliability in their facilities. It fosters both theoretical depth and practical application, aligning with modern industrial standards. Professionals completing this course will be well-positioned to advance in their roles across the energy, oil and gas, manufacturing, and utility sectors.