AMERICAN GLOBAL INSTITUTE FOR PRIVATE TRAINING

External Training Course

Next-Gen Instrumentation & SCADA Systems Maintenance

From 29 Sep. To 03 Oct. 2025
From 10 Nov. To 14 Nov. 2025
From 08 Dec. To 12 Dec. 2025

Holiday Inn Express Singapore Katong by IHG Hotel, Singapore

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External Training Course:

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From 29 Sep. To 03 Oct. 2025 Fees: 1900 KD
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Course Overview

This advanced-level program delivers a specialized and industry-driven curriculum designed for professionals seeking to master the complexities of modern instrumentation and SCADA system maintenance. The course goes beyond fundamental practices, focusing on high-availability architectures, advanced diagnostics, predictive maintenance analytics, and industrial cybersecurity frameworks. Participants will gain insights into reliability-centered maintenance (RCM), failure mode analysis (FMEA), digital twin applications, and AI/ML-driven predictive maintenance models, preparing them to design, manage, and secure mission-critical systems in highly demanding industrial environments such as oil & gas, power generation, petrochemicals, and utilities.

Key Learning Outcomes

By the end of this course, participants will be able to:

- Engineer advanced maintenance frameworks for next-gen instrumentation and SCADA systems.
- Conduct in-depth root cause failure analysis (RCFA) to eliminate chronic reliability issues.
- Deploy predictive analytics and digital twins for asset performance optimization.
- Implement cybersecurity best practices and compliance standards (IEC 62443, NIST) in SCADA environments.
- Design redundancy and disaster recovery strategies for uninterrupted system availability.
- Apply intelligent data analytics for real-time monitoring and early fault detection.
- Lead digital transformation initiatives integrating AI, IoT, and edge computing into SCADA maintenance strategies.

Target Audience

This specialized training is intended for:

- Senior Instrumentation & Control Engineers.
- SCADA System Engineers & Administrators.
- Maintenance & Reliability Engineers.
- Cybersecurity Specialists in Industrial Control Systems (ICS).
- Automation & Process Optimization Experts.
- Technical Supervisors & Engineering Leaders.

Training Methodology

Advanced technical lectures with in-depth analysis.
Case studies from oil & gas, power, and utilities sectors.
Hands-on Workshop troubleshooting & cyber-drills.
Interactive group workshops and technical problem-solving labs.
Capstone project for practical implementation.

Organisational Impact

Significant reduction in costly downtime through predictive intelligence.
Enhanced system resilience and cybersecurity maturity.
Optimized asset lifecycle management and improved ROI on automation infrastructure.
Strengthened compliance with international standards for industrial systems.
A technically advanced workforce prepared for Industry 4.0 transformation.

Personal Impact

Mastery of specialized techniques in SCADA and instrumentation reliability.
Ability to conduct advanced troubleshooting, FMEA, and root cause investigations.
Proficiency in predictive maintenance powered by AI and analytics.
Recognition as a subject matter expert in digital transformation of maintenance.
Career advancement toward lead engineer, SCADA architect, or reliability strategist roles.

Course Content & Outline

Day 1: Advanced Instrumentation & Intelligent Devices

- Evolution from conventional to smart instrumentation ecosystems
- Intelligent transmitters, self-diagnostic capabilities, and asset management
- Multivariable instruments and their application in advanced process control
- Fieldbus and Industrial Ethernet architectures for next-gen plants
- Wireless instrumentation & IIoT integration (ISA100, WirelessHART)
- Hands-On Exercise: Configuration and diagnostic analysis of intelligent devices

Day 2: Reliability-Centered Instrument Maintenance

- Preventive vs. Predictive vs. Prescriptive maintenance – advanced comparison
- Advanced calibration management systems and standards compliance (ISO 17025)
- Root Cause Failure Analysis (RCFA) applied to recurring field issues
- Asset lifecycle extension and obsolescence management strategies
- Redundancy planning for field instruments and safety instrumented systems
- Case Study: Instrumentation failure impact analysis in a petrochemical plant

Day 3: SCADA Architecture & Advanced Fault Management

- SCADA server virtualization, cloud integration & digital redundancy models
- Engineering high-availability SCADA architectures for mission-critical applications
- Real-time fault detection using data analytics & historian trends
- Protocol troubleshooting (Modbus, DNP3, IEC 61850, OPC-UA)
- Alarm management optimization & advanced human-machine interface (HMI) design
- Simulation Lab: Diagnosing and restoring a large-scale SCADA network failure

Day 4: Industrial Cybersecurity & Resilience

- Advanced ICS/SCADA threat modeling & vulnerability assessments
- Application of Zero-Trust Architecture in industrial networks
- Security Information and Event Management (SIEM) integration for SCADA
- Patch management and secure remote access frameworks
- Compliance mapping: IEC 62443, NIST 800-82, ISA/IEC 61511
- Cyber Drill: Attack-and-defense simulation on a test SCADA environment

Day 5: Digital Transformation & Predictive Maintenance Excellence

- Big Data, AI, and ML integration in SCADA predictive maintenance
- Digital twins for process optimization and failure forecasting
- Edge computing vs. cloud SCADA – advantages and implementation strategies
- Advanced KPI dashboards: MTBF, MTTR, OEE, and reliability indices
- Augmented & Virtual Reality (AR/VR) applications for remote maintenance support
- Capstone Project: Designing a predictive maintenance digital roadmap for an oil & gas facility

Course Agenda:

(1st Day) Agenda

9.00	11.30	Discuss Major Points Of Course: • Advanced Instrumentation & Intelligent Devices. • Reliability-Centered Instrument Maintenance. • SCADA Architecture & Advanced Fault Management. • Industrial Cybersecurity & Resilience. • Digital Transformation & Predictive Maintenance Excellence.
11.30	12.00	Coffee Break
12.00	14.00	Advanced Instrumentation & Intelligent Devices: • Evolution from conventional to smart instrumentation ecosystems. • Intelligent transmitters, self-diagnostic capabilities, and asset management. • Multivariable instruments and their application in advanced process control. • Fieldbus and Industrial Ethernet architectures for next-gen plants. • Wireless instrumentation & IIoT integration (ISA100, WirelessHART). • Hands-On Exercise: Configuration and diagnostic analysis of intelligent devices.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(2nd Day) Agenda

9.00	11.30	Reliability-Centered Instrument Maintenance: • Preventive vs. Predictive vs. Prescriptive maintenance – advanced comparison. • Advanced calibration management systems and standards compliance (ISO 17025). • Root Cause Failure Analysis (RCFA) applied to recurring field issues.
11.30	12.00	Coffee Break
12.00	14.00	Reliability-Centered Instrument Maintenance: • Asset lifecycle extension and obsolescence management strategies. • Redundancy planning for field instruments and safety instrumented systems. • Case Study: Instrumentation failure impact analysis in a petrochemical plant.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(3rd Day) Agenda

9.00	11.30	SCADA Architecture & Advanced Fault Management: • SCADA server virtualization, cloud integration & digital redundancy models. • Engineering high-availability SCADA architectures for mission-critical applications. • Real-time fault detection using data analytics & historian trends.
11.30	12.00	Coffee Break
12.00	14.00	SCADA Architecture & Advanced Fault Management: • Protocol troubleshooting (Modbus, DNP3, IEC 61850, OPC-UA). • Alarm management optimization & advanced human-machine interface (HMI) design. • Case Study: Diagnosing and restoring a large-scale SCADA network failure.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(4th Day) Agenda

9.00	11.30	Industrial Cybersecurity & Resilience: • Advanced ICS/SCADA threat modeling & vulnerability assessments. • Application of Zero-Trust Architecture in industrial networks. • Security Information and Event Management (SIEM) integration for SCADA.
11.30	12.00	Coffee Break
12.00	14.00	Industrial Cybersecurity & Resilience: • Patch management and secure remote access frameworks. • Compliance mapping: IEC 62443, NIST 800-82, ISA/IEC 61511. • Cyber Drill: Attack-and-defense simulation on a test SCADA environment.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

(5th Day) Agenda

9.00	11.30	Digital Transformation & Predictive Maintenance Excellence: • Big Data, AI, and ML integration in SCADA predictive maintenance. • Digital twins for process optimization and failure forecasting. • Edge computing vs. cloud SCADA – advantages and implementation strategies.
11.30	12.00	Coffee Break
12.00	14.00	Digital Transformation & Predictive Maintenance Excellence: • Advanced KPI dashboards: MTBF, MTTR, OEE, and reliability indices. • Augmented & Virtual Reality (AR/VR) applications for remote maintenance support. • Capstone Project: Designing a predictive maintenance digital roadmap for an oil & gas facility.
14.00	14.30	Questions, Discussion & Conclusion Training Course.
14.30		Buffet Lunch