AMERICAN GLOBAL INSTITUTE
FOR PRIVATE TRAINING

External Training Course

Automation Engineer: Process Automation, DCS Configuration & ESD Systems

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From 02 Jun. To 06 Jun. 2025
From 04 Aug. To 08 Aug. 2025
From 29 Sep. To 03 Oct. 2025
From 08 Dec. To 12 Dec. 2025

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Madrid, Spain

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External Training Course:

Automation Engineer: Process Automation, DCS Configuration & ESD Systems

From 02 Jun. To 06 Jun. 2025 Fees: 1750 KD
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Course Introduction:

In today's highly competitive and safety-conscious petroleum industry, process automation plays a critical role in ensuring reliable operations, maximum efficiency, and fail-safe responses during abnormal conditions. With increasing complexity in production facilities—whether upstream, midstream, or downstream—engineers must be well-versed in modern automation systems, particularly Distributed Control Systems (DCS) and Emergency Shutdown Systems (ESD), which form the backbone of safe and efficient plant operations. This specialized 5-day training course is designed to equip automation, instrumentation, and control professionals with the technical competencies and practical insights necessary for engineering, configuring, operating, and maintaining automation systems in the petroleum sector. Participants will gain hands-on knowledge of how DCS and ESD systems are designed, implemented, integrated, and maintained in compliance with international standards such as IEC 61511, ISA 84, and IEC 62443. Through interactive sessions, real-world case studies, configuration labs, and troubleshooting exercises, this course will provide both theoretical foundations and field-proven techniques to enhance safety, optimize control, and improve operational resilience in oil and gas processing environments.

Course Objectives:

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

- Understand modern process automation principles within petroleum operations.
- Configure and troubleshoot Distributed Control Systems (DCS).
- Design and maintain Emergency Shutdown (ESD) Systems in compliance with international safety standards.
- Integrate automation strategies for improved plant safety, efficiency, and reliability.
- Interpret process control diagrams and safety instrumented functions (SIF).
- Apply industry best practices in automation for enhanced production control.

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Training Methodology:

This course adopts a highly interactive and practical training methodology tailored to the needs of professionals in the petroleum industry. The training approach combines theoretical instruction with real-world applications, ensuring that participants not only understand the core concepts but also develop the skills to apply them in their operational environments. The methodology includes:

- Expert-led Lectures: Delivered by seasoned professionals with extensive experience in process automation, DCS, and ESD systems in oil and gas facilities.
- Hands-on Exercises: Participants will use tools to practice DCS configuration, process control scenarios, and design ESD logic.
- Case Studies and Industry Examples: Real-life case studies from petroleum operations will be analyzed to demonstrate best practices and lessons learned.
- Group Workshops and Problem-Solving Sessions: Interactive sessions designed to foster teamwork, critical thinking, and practical application of automation strategies.
- Technical Demonstrations: Live demonstrations of instrumentation, control logic, system diagnostics, and safety interlock testing.
- Q&A and Feedback Sessions: Opportunities for participants to engage in discussions, share operational challenges, and receive expert feedback.

This blended learning approach ensures maximum retention, practical skill development, and readiness to implement learned strategies directly in the field.

Key Points of the Training Course:

Understand modern industrial automation concepts in the oil and gas sector.
Gain in-depth knowledge of the architecture and functionality of Distributed Control Systems (DCS).
Acquire practical skills in DCS configuration, programming, and interface development.
Study international standards for safety systems (IEC 61511 / ISA 84).
Design Emergency Shutdown (ESD) systems and integrate them with Fire & Gas (F&G) systems.
Implement effective maintenance strategies and troubleshoot DCS and ESD systems.
Use diagnostic tools and field communication protocols (HART, Foundation Fieldbus, Modbus).
Apply automation strategies to enhance production efficiency and operational safety.
Explore the integration of automation systems with SCADA, PLCs, and Industrial IoT (IIoT) technologies.
Improve cybersecurity awareness for industrial control systems in line with IEC 62443.
Learn from real-world case studies in upstream, midstream, and downstream environments.
Participate in hands-on workshops that simulate real plant scenarios and enhance technical competence.

Course Outline:

Day 1: Fundamentals of Process Automation in the Petroleum Sector

- Introduction to Automation in Oil & Gas Industry.
- Overview of Process Control and Instrumentation.
- Types of Process Automation (Open-loop, Closed-loop, Batch, Continuous).
- Key Components: Sensors, Transmitters, Controllers, Actuators.
- Control Strategies in Refining, Production & Transportation.
- Case Study: Automation in Upstream vs. Downstream Operations.

Day 2: Distributed Control Systems (DCS) – Architecture & Configuration

- DCS Architecture: Controllers, I/O Modules, HMI, Networks.
- Communication Protocols (Modbus, Foundation Fieldbus, HART, Ethernet/IP).
- DCS Programming & Configuration Basics.
- HMI/SCADA Integration with DCS.
- Alarm Management & Operator Interfaces.
- Hands-on Session: Basic DCS Configuration.

Day 3: Emergency Shutdown Systems (ESD) – Design, Safety & Reliability

- ESD Overview and Importance in Petroleum Plants.
- Safety Instrumented Systems (SIS) and IEC 61511/ISA 84 Compliance.
- Layers of Protection Analysis (LOPA).
- Safety Integrity Level (SIL) Determination.
- Fail-safe Design Principles.
- Integration of ESD with Fire & Gas (F&G) Systems.
- Workshop: Designing an ESD Logic Diagram.

Day 4: Maintenance, Troubleshooting & Diagnostics of DCS and ESD

- Preventive vs. Predictive Maintenance Approaches.
- Troubleshooting Common DCS Faults.
- ESD Testing Procedures and Bypass Management.
- Diagnostics Tools & HART Communicators.
- Firmware Upgrades & System Backup/Restore.

Day 5: Integrated Automation Strategy & Digital Transformation

- Integration with PLCs, SCADA, and IIoT Platforms.
- Digital Twins and Advanced Process Control (APC).
- Cybersecurity in Automation Systems (ISA/IEC 62443).
- Best Practices in Automation Lifecycle Management.
- KPI Monitoring and System Optimization.
- Final Group Exercise: Developing an Integrated Automation Strategy for a Gas Processing Facility.

Course Details & Agenda:

1st Day Agenda

8.30	9.00	Opening Remarks (30 Min.).
9.00	11.30	Discussion of Course Topics: • Fundamentals of Process Automation in the Petroleum Sector. • Distributed Control Systems (DCS) – Architecture & Configuration. • Emergency Shutdown Systems (ESD) – Design, Safety & Reliability. • Maintenance, Troubleshooting & Diagnostics of DCS and ESD. • Integrated Automation Strategy & Digital Transformation.
11.30	12.00	Coffee Break
12.00	14.00	Fundamentals of Process Automation in the Petroleum Sector: • Introduction to Automation in Oil & Gas Industry. • Overview of Process Control and Instrumentation. • Types of Process Automation (Open-loop, Closed-loop, Batch, Continuous). • Key Components: Sensors, Transmitters, Controllers, Actuators. • Control Strategies in Refining, Production & Transportation. • Case Study: Automation in Upstream vs. Downstream Operations.
15.00	14.30	Questions and Discussion
14.30		Buffet Lunch

2nd Day Agenda

9.00	11.30	Distributed Control Systems (DCS) – Architecture & Configuration: • DCS Architecture: Controllers, I/O Modules, HMI, Networks. • Communication Protocols (Modbus, Foundation Fieldbus, HART, Ethernet/IP). • DCS Programming & Configuration Basics.
11.30	12.00	Coffee Break
12.00	14.00	Distributed Control Systems (DCS) – Architecture & Configuration: • HMI/SCADA Integration with DCS. • Alarm Management & Operator Interfaces. • Hands-on Session: Basic DCS Configuration.
15.00	14.30	Questions and Discussion
14.30		Buffet Lunch

3rd Day Agenda

9.00	11.30	Emergency Shutdown Systems (ESD) – Design, Safety & Reliability: • Fail-safe Design Principles. • Integration of ESD with Fire & Gas (F&G) Systems. • Workshop: Designing an ESD Logic Diagram.
11.30	12.00	Coffee Break
12.00	14.00	Emergency Shutdown Systems (ESD) – Design, Safety & Reliability: • ESD Overview and Importance in Petroleum Plants. • Safety Instrumented Systems (SIS) and IEC 61511/ISA 84 Compliance. • Layers of Protection Analysis (LOPA). • Safety Integrity Level (SIL) Determination.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

4th Day Agenda

9.00	11.30	Maintenance, Troubleshooting & Diagnostics of DCS and ESD: • Preventive vs. Predictive Maintenance Approaches. • Troubleshooting Common DCS Faults. • ESD Testing Procedures and Bypass Management.
11.30	12.00	Coffee Break
12.00	14.00	Maintenance, Troubleshooting & Diagnostics of DCS and ESD: • Diagnostics Tools & HART Communicators. • Firmware Upgrades & System Backup/Restore.
14.00	14.30	Questions and Discussion
14.30		Buffet Lunch

5th Day Agenda

9.00	11.30	Integrated Automation Strategy & Digital Transformation: • Integration with PLCs, SCADA, and IIoT Platforms. • Digital Twins and Advanced Process Control (APC). • Cybersecurity in Automation Systems (ISA/IEC 62443).
11.30	12.00	Coffee Break
12.00	14.00	Integrated Automation Strategy & Digital Transformation: • Best Practices in Automation Lifecycle Management. • KPI Monitoring and System Optimization. • Final Group Exercise: Developing an Integrated Automation Strategy for a Gas Processing Facility.
14.00	14.30	Questions, Discussion & Conclusion Training Course.
14.30		Buffet Lunch