Advanced DCS Engineering and Control Logic Design Training Course



14 - 18 Dec 2026

Barcelona

5900 € (Per Person)

Ref: #ERE9785_94185

Course Introduction / Overview:

This comprehensive course provides an in-depth exploration of Distributed Control Systems (DCS), from fundamental principles to advanced engineering and logic design. In today's highly automated industrial landscape, a robust understanding of DCS is critical for ensuring operational efficiency, safety, and reliability. This program is meticulously designed to bridge the gap between theoretical knowledge and practical application, empowering participants to design, implement, and manage complex control strategies. Drawing upon established principles in process control, as detailed by authorities like William L. Luyben in his seminal work "Process Modeling, Simulation, and Control for Chemical Engineers", the curriculum covers the entire DCS lifecycle. Participants will delve into system architecture, hardware configuration, control logic programming using IEC 61131-3 standards, and advanced process control techniques. BIG BEN Training Center has developed this course to equip engineers and technicians with the skills needed to tackle real-world challenges, including system integration, HMI development, network security, and effective troubleshooting. The training moves beyond basic operations to foster a deep-seated expertise in optimizing and securing modern industrial automation systems.

Target Audience / This training course is suitable for:

- Process Control Engineers.
- Automation Engineers and Specialists.
- Instrumentation and Control Technicians.
- Plant Operations and Maintenance Personnel.
- System Integrators and Consultants.
- Project Engineers involved in control system design.
- Electrical and Chemical Engineers seeking specialization.
- IT professionals responsible for industrial network security.

Target Sectors and Industries:

- Oil and Gas Production and Refining.
- Power Generation and Distribution.
- Chemical and Petrochemical Manufacturing.
- Pharmaceuticals and Biotechnology.
- Water and Wastewater Treatment Facilities.
- Pulp and Paper Production.
- Food and Beverage Processing.
- Governmental bodies and regulatory agencies overseeing industrial operations.

Target Organizations Departments:

- Engineering and Design.
- Plant Operations and Production.
- Maintenance and Reliability.
- Instrumentation and Control (I&C).
- Information Technology (IT) and OT Security.
- Project Management.
- Health, Safety, and Environment (HSE).
- Research and Development.

Course Offerings:

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

- Analyze and design robust DCS architectures for various industrial applications.
- Configure DCS hardware components, including controllers and I/O modules.
- Develop and implement control logic using Function Block Diagrams (FBD) and Sequential Function Charts (SFC).
- Apply advanced process control strategies, including cascade and feedforward control.
- Design intuitive and effective Human-Machine Interface (HMI) screens.
- Troubleshoot common issues within DCS hardware, software, and networks.
- Implement fundamental cybersecurity measures to protect industrial control systems.
- Manage the lifecycle of a DCS project from conception to commissioning.
- Optimize control loop performance through systematic tuning methods.
- Integrate DCS with other plant systems like PLCs and SCADA.

Course Methodology:

The training methodology at BIG BEN Training Center is centered on creating an immersive and practical learning environment that maximizes knowledge retention and skill development. This course employs a blended approach, combining expert-led instruction with hands-on exercises and real-world case studies. Participants will engage in interactive sessions, group discussions, and collaborative problem-solving activities that mirror the challenges faced in industrial settings. A significant portion of the course is dedicated to practical labs where attendees will work with simulated DCS environments to configure hardware, program control logic, and design HMI graphics. This hands-on experience solidifies theoretical concepts and builds confidence in applying them. Our instructors facilitate a dynamic learning atmosphere, encouraging questions and sharing insights from their extensive field experience. The curriculum is structured to build knowledge progressively, ensuring a solid foundation before moving to more complex topics. Continuous feedback and guided practice are integral to our approach, ensuring every participant achieves the course objectives and leaves with tangible skills ready for immediate application in their workplace.

Course Agenda (Course Units):

Unit One Introduction to Distributed Control Systems

- DCS evolution and its role in industrial automation.
- Comparing DCS with PLC and SCADA systems.
- Fundamental DCS architecture and hierarchy levels.
- Core hardware components: controllers, I/O modules, and workstations.
- Understanding controller redundancy and system availability.
- Introduction to fieldbus technologies like Foundation Fieldbus and Profibus.
- System power, grounding, and environmental considerations.

Unit Two DCS Configuration and Programming Fundamentals

- Navigating the DCS engineering and configuration environment.
- Creating a new project and defining the system layout.
- Configuring hardware and I/O channels.
- Introduction to IEC 61131-3 programming languages.
- Developing control logic with Function Block Diagrams (FBD).
- Implementing sequential control using Sequential Function Charts (SFC).
- Best practices for documenting and structuring control logic.

Unit Three Advanced Process Control and Logic Design

- Mastering PID control loop configuration and tuning.
- Implementing advanced control strategies: cascade, ratio, and feedforward control.
- Designing complex interlocks and permissive logic for safety.
- Developing effective alarm management philosophies and configurations.
- Implementing batch control strategies using the S88 model.
- Techniques for analog signal processing and scaling.
- Logic for motor control, valve control, and other common field devices.

Unit Four HMI Development and System Networking

- Principles of effective HMI design for operator efficiency.
- Developing graphic displays, faceplates, and trend objects.
- Configuring historical data collection and reporting.
- Understanding DCS network architecture and protocols.
- Configuring communication between controllers and operator stations.
- Integrating third-party devices and subsystems.
- Fundamentals of OPC (OLE for Process Control) for data exchange.

Unit Five System Maintenance, Troubleshooting, and Security

- DCS project lifecycle: from design to commissioning and startup.
- Developing a preventive maintenance strategy for DCS hardware.
- Systematic troubleshooting techniques for hardware, software, and network issues.
- Utilizing diagnostic tools and interpreting system logs.
- Introduction to industrial control system (ICS) cybersecurity threats.
- Implementing fundamental security controls like user access management.
- Best practices for system backup, recovery, and disaster planning.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

As DCS platforms increasingly integrate with IIoT and cloud computing, how might the traditional hierarchical control model (Purdue Model) evolve to accommodate decentralized intelligence and data analytics at the edge?

What unique qualities does this course offer compared to other courses?

This course distinguishes itself by offering a holistic and vendor-neutral perspective on Distributed Control Systems, focusing on the universal engineering principles and logic design concepts that underpin all major platforms. Unlike training that is tied to a specific manufacturer's product, this program equips participants with a versatile and transferable skill set, enabling them to adapt to any DCS environment. Our curriculum emphasizes the "why" behind the "how," delving into advanced process control theory and alarm management philosophies that are crucial for optimizing plant performance and safety, not just basic configuration. The course content is deeply practical, built around real-world industrial scenarios and case studies that challenge participants to solve complex problems. Furthermore, we integrate a dedicated unit on the DCS lifecycle and cybersecurity, recognizing that a modern control engineer's responsibilities extend far beyond programming. This comprehensive approach ensures that graduates are not just technicians but well-rounded automation professionals capable of managing, securing, and enhancing critical control systems throughout their entire operational life.