Industrial Automation and PLC for Power Systems Training Course



14 - 18 Dec 2026

Cape town

4600 € (Per Person)

Ref: #ERE2310_273840

Course Introduction / Overview:

This comprehensive training course provides an in-depth exploration of industrial automation and Programmable Logic Controller (PLC) programming, specifically tailored for applications within modern power systems. In an era where grid stability, efficiency, and security are paramount, the ability to design, implement, and maintain automated control systems is a critical skill. This program bridges the gap between theoretical electrical engineering principles and the practical application of PLCs in real-world power generation, transmission, and distribution scenarios. Drawing upon foundational concepts outlined in texts like "Programmable Logic Controllers" by W. Bolton, the curriculum covers everything from basic PLC hardware and ladder logic to advanced SCADA systems and industrial networking protocols. Participants will gain hands-on experience in developing control strategies for critical power system components. BIG BEN Training Center has designed this course to empower professionals with the expertise needed to enhance system reliability, optimize operational performance, and troubleshoot complex automation challenges in the dynamic energy sector. This course is the definitive guide for mastering the technologies that power our world.

Target Audience / This training course is suitable for:

- Electrical Engineers and Technicians.
- Power System Operators and Dispatchers.
- Automation and Control Engineers.
- Instrumentation Technicians.
- Maintenance and Reliability Professionals.
- Project Engineers involved in power infrastructure projects.
- System Integrators working in the energy sector.
- Consultants specializing in power system automation.
- Recent engineering graduates seeking to specialize in industrial control.

Target Sectors and Industries:

- Electric Power Generation Utilities.
- Power Transmission and Distribution Companies.
- Renewable Energy Sector (Solar, Wind, Hydro).
- Heavy Manufacturing and Industrial Plants.
- Oil and Gas Processing and Refineries.
- Water and Wastewater Treatment Facilities.
- Governmental bodies and regulatory agencies overseeing energy infrastructure.
- Data Centers and Critical Infrastructure Facilities.

Target Organizations Departments:

- Operations and Maintenance.
- Engineering and Design.
- Control and Instrumentation (C&I).
- Substation Engineering and Maintenance.
- Power Plant Operations.
- Technical Services.
- Asset Management.
- Health, Safety, and Environment (HSE).
- Project Management.

Course Offerings:

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

- Understand the fundamental principles of industrial automation and its role in power systems.
- Identify and select appropriate PLC hardware and I/O modules for power applications.
- Design, write, and troubleshoot PLC programs using Ladder Logic (LD) and Function Block Diagrams (FBD).
- Develop and configure Human-Machine Interface (HMI) screens for monitoring and control.
- Implement control logic for common power system equipment like circuit breakers, transformers, and motors.
- Integrate PLCs into a larger SCADA system for centralized supervision and data acquisition.
- Apply industrial communication protocols such as Modbus and DNP3 for system connectivity.
- Analyze and troubleshoot faults in automated power system processes.
- Understand the basic principles of cybersecurity for Industrial Control Systems (ICS).
- Evaluate and apply automation strategies for improving grid reliability and efficiency.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to be highly interactive, practical, and engaging, ensuring that participants can immediately apply their learning in a professional context. This course moves beyond traditional lectures by incorporating a blended learning approach that emphasizes hands-on experience. A significant portion of the training will be dedicated to practical sessions using industry-standard PLC simulation software, allowing participants to program, test, and debug control logic in a safe and controlled environment. The curriculum is enriched with real-world case studies drawn from the power industry, analyzing both successful automation projects and control system failures to draw critical lessons. Group discussions, collaborative problem-solving exercises, and team-based projects will be used to foster a deeper understanding of complex concepts and encourage the sharing of diverse perspectives. Our expert instructors facilitate a dynamic learning environment, providing continuous feedback and personalized guidance to ensure every participant masters the course objectives and develops the confidence to tackle real-world automation challenges.

Course Agenda (Course Units):

Unit One Introduction to Industrial Automation and Power Systems

- Fundamentals of Industrial Control Systems (ICS).
- Overview of Power Generation, Transmission, and Distribution.
- The role of automation in enhancing grid stability and reliability.
- Introduction to Programmable Logic Controllers (PLCs).
- Comparison of PLCs, relays, and microcontrollers.
- PLC architecture, components, and operation cycle.
- Safety considerations in automated electrical environments.

Unit Two PLC Hardware and Fundamental Programming

- PLC Hardware Selection and Configuration.
- Digital and Analog I/O Modules.
- Wiring diagrams and best practices for I/O connections.
- Introduction to the IEC 61131-3 programming standard.
- Fundamentals of Ladder Logic (LD) programming.
- Implementing basic logic functions (AND, OR, NOT, XOR).
- Utilizing timers, counters, and internal relays in power applications.

Unit Three Advanced PLC Programming and HMI

- Programming with Function Block Diagrams (FBD).
- Data handling, memory registers, and file manipulation.
- Implementing mathematical and comparison instructions.
- Introduction to Human-Machine Interface (HMI) systems.
- Designing intuitive HMI screens for power system monitoring.
- Configuring alarms, trends, and data logging.
- Establishing communication between PLC and HMI.

Unit Four PLC Applications in Power System Control

- Automation of Substation Operations.
- PLC-based control of circuit breakers and switchgear.
- Automatic Transfer Switch (ATS) and load shedding logic.
- Motor control applications for pumps, fans, and conveyors.
- Generator start-up, synchronization, and protection schemes.
- Transformer tap changer control and voltage regulation.
- Troubleshooting and debugging application-specific PLC code.

Unit Five SCADA, Networking, and Modern Trends

- Introduction to Supervisory Control and Data Acquisition (SCADA) systems.
- Architecture of a typical power system SCADA network.
- Industrial communication protocols (Modbus, DNP3, Profibus).
- Configuring PLC communication networks.
- Introduction to cybersecurity for PLCs and SCADA systems.
- The role of PLCs in Smart Grids and renewable energy integration.
- Future trends in power system automation and the Industrial Internet of Things (IIoT).

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 power grids become more decentralized with the integration of renewables, how must PLC and SCADA architectures evolve to ensure stability and security?

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

This course distinguishes itself by moving beyond generic PLC programming to focus specifically on the high-stakes environment of power systems. While many courses teach the "what" and "how" of ladder logic, we concentrate on the "why" within the context of power generation, transmission, and distribution. Participants will not just learn to program a timer; they will learn to implement a reclosing sequence for a circuit breaker or a load-shedding scheme to prevent a blackout. The curriculum is uniquely structured to build a bridge between electrical power theory and practical automation, a niche often overlooked by generalist training. We integrate crucial, up-to-date topics such as SCADA system architecture, industry-specific protocols like DNP3, and the increasingly vital subject of cybersecurity for industrial control systems. The course emphasizes a holistic understanding, ensuring that graduates can not only write code but also design, troubleshoot, and maintain robust automation systems that enhance the safety, reliability, and efficiency of critical power infrastructure. This application-specific focus provides a depth of knowledge and practical skill set that is directly transferable to the modern energy sector.