Fundamentals of Industrial Electrical and Automation Systems Training Course

Ref: #INM1337

Course Introduction / Overview:

This comprehensive program provides a deep dive into the core principles and practical applications of modern industrial electrical and automation systems. Participants will master key concepts that are vital for maintaining and optimizing the complex machinery and processes that drive today's manufacturing and industrial sectors. The curriculum goes beyond basic theory, focusing on hands-on skills, practical troubleshooting, and the latest technologies in industrial automation, including programmable logic controllers (PLCs), human-machine interfaces (HMIs), and supervisory control and data acquisition (SCADA) systems. The course integrates the latest insights from influential academic works such as Industrial Instrumentation, Control and Automation by S. Mukhopadhyay, S. Sen and A. K. Deb, providing a solid theoretical foundation that prepares technicians to excel in the field. BIG BEN Training Center has meticulously designed this course to ensure every participant gains the knowledge and confidence to handle real-world challenges, from diagnosing electrical faults to programming intricate automation sequences. It's an essential program for anyone looking to build a strong career in the rapidly evolving world of industrial technology and control. This training provides practical, job-oriented skills that are in high demand across a wide range of industries, helping technicians bridge the gap between classroom knowledge and on-the-job expertise.

Target Audience / This training course is suitable for:

- Electrical and instrumentation technicians.
- Automation and control engineers.
- Maintenance and reliability technicians.
- Industrial electricians.
- Plant operators and supervisors.
- Mechatronics technicians.
- Anyone aspiring to a career in industrial automation or control systems.

Target Sectors and Industries:

- Manufacturing and production.
- Oil and gas.
- Food and beverage.
- Pharmaceuticals.
- Automotive and aerospace.
- Chemicals.
- Government agencies and utilities.

Target Organizations Departments:

- Maintenance and engineering departments.
- Operations departments.
- Production and manufacturing departments.
- Control systems and automation teams.
- Technical support and field service teams.
- Research and development divisions.

Course Offerings:

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

- Diagnoses and troubleshoot common electrical and automation system faults with speed and accuracy.
- Program and configure programmable logic controllers (PLCs) using standard ladder logic and other languages.
- Design and implement basic human-machine interface (HMI) screens for process control and monitoring.
- Calibrate and maintain various industrial sensors, actuators, and instrumentation.
- Understand and apply safety protocols, including LOTO (lockout/tagout), for working on electrical equipment.
- Interpret complex electrical schematics and technical documentation.
- Gain proficiency in industrial networking protocols such as Modbus and Ethernet/IP.
- Work with supervisory control and data acquisition (SCADA) systems for plant-wide control and data collection.

Course Methodology:

BIG BEN Training Center's approach is designed to be highly interactive and application-based, ensuring that participants don’t just learn about concepts but can actually apply them effectively. The course is built around a practical framework that includes a variety of training methods. Hands-on labs and workshops are cornerstone, where participants work with real-world equipment to simulate industrial environments. This allows them to practice PLC programming, troubleshoot electrical circuits, and configure automation components in a controlled, safe setting. The training also uses a variety of case studies based on actual industry scenarios, which helps participants analyze complex problems and develop strategic solutions. Group discussions and team activities encourage collaborative problem-solving and knowledge sharing. Instructors provide continuous feedback and support, ensuring a personalized learning experience for every individual. This methodology combines theoretical instruction with practical application, creating a dynamic learning environment that prepares technicians for the challenges of industrial automation and electrical systems.

Course Agenda (Course Units):

Unit One: Foundations of Industrial Electrical Systems and Safety

- Understanding industrial electrical schematics and symbols.
- Fundamentals of AC and DC circuits.
- Electrical measurement and diagnostic tools.
- Essential safety protocols for industrial environments.
- Introduction to motors and motor control circuits.
- Troubleshooting electrical faults.
- Selecting and using control components.

Unit Two: Introduction to Industrial Automation and Programmable Logic Controllers (PLCs)

- Overview of industrial automation systems.
- PLC hardware, architecture, and components.
- Fundamentals of ladder logic programming.
- PLC input and output (I/O) configuration.
- Basic PLC programming exercises.
- Data types and addressing in PLCs.
- Best practices for PLC program documentation.

Unit Three: Advanced PLC Programming and HMI Integration

- Timers, counters, and other advanced PLC instructions.
- Developing sequential control logic.
- Implementing PID loops for process control.
- Introduction to human-machine interfaces (HMIs).
- Designing and linking HMI screens to a PLC.
- Data logging and alarming.
- Basic SCADA system concepts.

Unit Four: Industrial Instrumentation and Process Control

- Principles of industrial sensors and transmitters (temperature, pressure, flow, level).
- Calibration and maintenance of process instruments.
- Control valves and actuators.
- Pneumatic and hydraulic systems.
- Closed-loop control systems.
- Advanced troubleshooting of instrumentation loops.
- Signal conditioning and conversion.

Unit Five: Industrial Networking and System Integration

- Overview of industrial communication protocols.
- Configuring network devices and systems.
- Ethernet/IP and Modbus protocols.
- Integrating different automation components and systems.
- Data acquisition and reporting.
- System startup and commissioning.
- Cybersecurity fundamentals for industrial control systems.

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:

How can a deeper understanding of industrial electrical principles fundamentally change how technicians approach troubleshooting in an era of increasing automation complexity?

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

This training distinguishes itself by providing an unparalleled blend of foundational theory and practical application. While many courses focus on just one aspect, BIG BEN Training Center's program ensures participants achieve a holistic understanding of industrial electrical systems and automation controls. The curriculum is specifically designed around the needs of industrial technicians, focusing on the most relevant and in-demand skills in the field. This includes hands-on labs with state-of-the-art equipment, which allows participants to practice everything from complex PLC programming to diagnosing difficult electrical faults. The course structure emphasizes real-world scenarios and case studies, moving beyond abstract concepts to give participants a true feel for the challenges and solutions they will encounter on the job. Our unique methodology, which incorporates teamwork and a strong focus on practical troubleshooting, is meant to help technicians think critically and solve problems under pressure. This approach gives participants a significant edge, making them more capable and confident in their roles. It is a highly focused program that directly prepares individuals for the demands of the modern industrial workplace, setting a new standard for technical skills training.