Applied Automation for Industrial Control Systems Training Course

Ref: #INM3312

Course Introduction / Overview:

This comprehensive training course provides an in-depth exploration of industrial control systems and programmable logic controllers. It's designed for professionals who want to develop practical, hands-on skills in PLC programming, a cornerstone of modern manufacturing and industrial automation. The curriculum, developed by BIG BEN Training Center, covers everything from foundational principles to advanced applications. It equips participants with the expertise needed to design, implement, and troubleshoot automated systems effectively. Participants will delve into various PLC architectures, programming languages like Ladder Logic and Structured Text, and the integration of control systems with sensors, actuators, and human-machine interfaces. The course also explores the vital importance of cybersecurity in industrial control systems (ICS). It draws on established principles outlined by academic leaders like M. T. White, author of "Mastering PLC Programming," a book that emphasizes the application of software engineering practices to industrial automation projects. This course goes beyond theory, focusing on real-world scenarios and hands-on exercises that prepare participants for the challenges of today's industrial landscape.

Target Audience / This training course is suitable for:

- Engineers in electrical, mechanical, and automation fields.
- Maintenance and technical staff in manufacturing.
- Systems integrators and control panel designers.
- Instrumentation technicians.
- Individuals pursuing a career in industrial automation.

Target Sectors and Industries:

- Manufacturing and production facilities.
- Energy, oil, and gas industries.
- Water treatment and utilities.
- Pharmaceutical and chemical plants.
- Government agencies and public infrastructure projects.
- Building management systems.

Target Organizations Departments:

- Engineering and maintenance departments.
- Operations and production teams.
- Research and development units.
- Quality control and assurance departments.
- Industrial cybersecurity and IT departments.

Course Offerings:

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

- Design and configure a complete industrial control system.
- Write and debug PLC programs using standard programming languages.
- Implement and troubleshoot Ladder Logic, Structured Text, and Function Block Diagram applications.
- Integrate PLCs with industrial sensors, actuators, and HMI.
- Develop strategies for industrial networking and communication protocols.
- Apply best practices for system security and disaster recovery in industrial control environments.
- Perform systematic diagnostics and fault analysis to ensure system reliability.

Course Methodology:

This training course is built around a dynamic and hands-on methodology to ensure a deep and practical understanding of industrial control systems and PLC programming. The approach combines theoretical instruction with extensive practical application. Each session includes instructor-led lectures, interactive discussions, and real-world case studies to reinforce key concepts. Participants will work on a series of practical exercises and projects that simulate common industrial scenarios, giving them experience in designing, programming, and troubleshooting systems. Collaborative problem-solving sessions encourage teamwork and the sharing of insights. The course also incorporates feedback mechanisms, allowing instructors to provide personalized guidance and helping participants to track their progress. This blended approach ensures that participants not only grasp the technical details but also develop the critical thinking skills necessary to succeed in the complex field of industrial automation. BIG BEN Training Center is committed to providing a learning environment that is both challenging and supportive, ensuring every participant can confidently apply their new skills on the job.

Course Agenda (Course Units):

Unit One: Fundamentals of Industrial Automation

- Introduction to industrial control systems and their components.
- Overview of PLC architecture and hardware.
- Understanding I/O devices, sensors, and actuators.
- Introduction to ladder logic programming.
- The role of industrial communication protocols.

Unit Two: PLC Programming and Logic

- Exploring different PLC programming languages (IEC 61131-3).
- Structured programming and creating efficient code.
- Implementing timers, counters, and data manipulation instructions.
- Developing and documenting a PLC program.
- Debugging and testing PLC logic.

Unit Three: Advanced PLC Functions

- Working with analog inputs and outputs.
- Proportional-integral-derivative (PID) control loops.
- Configuring and programming human-machine interfaces (HMI).
- Implementing sequential function charts and state machines.
- Advanced data management and memory management.

Unit Four: Industrial Networking and Integration

- Industrial Ethernet and other key communication standards.
- Establishing communication between PLCs and HMI.
- Integrating variable speed drives and servo control.
- Supervisory Control and Data Acquisition (SCADA) systems.
- An introduction to cloud integration for industrial applications.

Unit Five: System Security and Troubleshooting

- Threats and vulnerabilities in industrial control systems.
- Best practices for securing PLC and network components.
- Systematic troubleshooting techniques for hardware and software issues.
- Preventative maintenance and risk assessment.
- Final project: Design, program, and commission a complete automation solution.

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:

In an increasingly interconnected world, how can we balance the efficiency and productivity gains of smart factories with the imperative to protect industrial control systems from evolving cyber threats?

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

This course stands out by providing an intensive, hands-on experience that mirrors the realities of the modern industrial environment. While many programs focus on isolated theoretical concepts, this course integrates principles of industrial control, PLC programming, and system security into a cohesive, project-based curriculum. Participants will not simply learn how to write code; they will gain a holistic understanding of how each component of a control system works together. For instance, rather than just learning about HMI, participants will program an HMI to visualize and control a real-time process, experiencing the connection between the user interface and the underlying PLC logic. We also place strong emphasis on industrial cybersecurity, a crucial topic often overlooked in traditional courses. By focusing on practical, real-world applications and including insights from academic and industry leaders, BIG BEN Training Center ensures participants leave with the competence and confidence to tackle complex automation challenges immediately.