



Project No.
2039

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2025

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Mechanical

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المكتب الهندسي لخدمات التكنولوجيا والبرمجيات

Engineering office for Technology and Software Services



PLC Programming: Industrial Process Control Using PLCs



Course Code: 2039-MECH/NC

Category: Industrial Control & Automation

Duration: 5 Weeks (15 sessions, 2 hours each)

Main Branch: United building – E Shams –Front NBE
, El Siouf _Alexandria

Tel: 01102060500-01144470856



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المعهد الهندسي لخدمات التكنولوجيا والبرمجيات

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1. Introduction

PLC (Programmable Logic Controller) systems form the backbone of modern industrial automation. This course teaches you how to program, simulate, and troubleshoot PLC-based control systems, covering both digital and analog operations, and integration with HMIs.



2. Target Audience

- Control & Automation Engineers
- Electrical & Electronics Engineers
- Industrial Maintenance Technicians



3. Objectives

By the end of this course, you will:

- Understand the core components and types of PLCs
- Write and test basic to advanced control programs
- Connect PLCs to industrial equipment and sensors
- Implement hands-on projects for process control
- Integrate PLC systems with HMI for real-time monitoring



4. What You Will Learn

- Basics of PLCs and their architecture
- Ladder Logic (LD) programming language
- Digital and analog I/O configuration

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- Using timers, counters, and PID controllers
- Communication protocols (Modbus, Profibus)
- Fault diagnosis and system simulation
- Connecting PLCs to HMI systems
- Designing real-time monitoring dashboards

5. Materials Provided

- PLC programming manuals (Siemens & Allen Bradley)
- Sample ladder logic programs and exercises
- Simulation files and lab setups
- Troubleshooting guides
- Case studies and real-world scenarios
- Session recordings and Q&A summaries

6. Requirements

- Basic understanding of automation or electrical systems
- Laptop with TIA Portal or Studio 5000 (trial versions acceptable)
- Enthusiasm for industrial control systems and programming

7. Time Frame

- **Total Duration:** 5 Weeks
- **Sessions:** 15 sessions (2 hours each)

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- **Schedule:** 3 sessions/week (e.g., Sunday, Tuesday, Thursday)
- **Support:** Weekly feedback and troubleshooting assistance



8. Course Format

- Instructor-led live sessions (Zoom/MS Teams)
- Interactive labs and simulation-based tasks
- Weekly assignments and code reviews
- Final project with evaluation
- Completion certificate provided



9. Detailed Weekly Breakdown



Week 1: Introduction to PLCs and System Components

- What is a PLC and types (Siemens, Allen Bradley)
 - Core components: CPU, I/O modules, power supplies
 - Introduction to Ladder Logic programming (LD)
 - Setting up programming environment (TIA Portal or Studio 5000)
- Practice:** Basic PLC configuration and I/O testing



Week 2: Basic Programming & Digital Control

- Writing programs using Ladder Logic
 - Configuring digital inputs and outputs
 - Working with timers and counters
- Practice:** Motor control and traffic light simulation

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Week 3: Analog Control and Communication

- Analog I/O configuration
 - Implementing PID controllers in PLC
 - Industrial protocols: Modbus, Profibus
- Practice:** PID-based temperature control project



Week 4: Advanced Projects & Troubleshooting

- Multi-device control: Conveyor belts, batch mixers
 - Debugging and error handling
 - System testing and simulation
 - Best practices for code structure and maintenance
- Practice:** Full production line control scenario



Week 5: HMI Integration & Real-Time Monitoring

- Connecting PLCs to Human-Machine Interfaces (HMIs)
 - Designing user-friendly HMI screens
 - Real-time data display and alarms
- Final Project:** Full PLC-HMI integration with process monitoring

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