

Automation & PLC Programming Essentials

Master PLC systems and integrate sensors for robotic control. Ideal for automation engineers and technicians.

Programming Instructor: Michael Carter • 5 sections • 50 lessons • 18.25h total

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About this course

Modern industrial automation requires precise integration of sensors, PLCs, and robotic systems. Professionals often face challenges in programming and troubleshooting these complex setups, which can lead to downtime and inefficiencies. This course provides a step-by-step guide to PLC programming, from basic sensor handling to advanced robotic control. You'll learn through video lessons, real-world case studies, and hands-on exercises, covering topics like ladder logic, HMI design, and motion control.

Course curriculum

Foundations and Preparation

- **Introduction to Industrial Automation Systems (18m)**
Overview of automation components and their roles in manufacturing.
- **Basics of PLC Hardware and Architecture (25m)**
Step-by-step guide to PLC hardware setup and architecture.
- **Understanding Industrial Sensors and Actuators (15m)**
Real case study on sensor types and their applications.
- **PLC Programming Fundamentals: Ladder Logic (30m)**
Hands-on session on writing basic ladder logic programs.
- **Safety Standards in Automation (12m)**
Problem-solving session on implementing safety protocols.
- **Setting Up a PLC Development Environment (20m)**
Guide to software installation and configuration.
- **Basic Input/Output (I/O) Configuration (18m)**
Practical exercise on configuring PLC I/O modules.

Core Concepts

- **Advanced Ladder Logic Programming (25m)**
Deep dive into timers, counters, and complex logic.
- **Structured Text and Other PLC Languages (20m)**
Introduction to alternative programming methods.
- **Sensor Signal Processing and Calibration (18m)**
Case study on calibrating sensors for accuracy.
- **PLC Communication Protocols (22m)**
Step-by-step setup of Modbus and Ethernet/IP.
- **Human-Machine Interface (HMI) Basics (30m)**
Designing effective HMI screens for automation.
- **Motion Control with PLCs (25m)**
Hands-on guide to controlling stepper and servo motors.
- **Introduction to Robotic Systems (15m)**
Overview of industrial robots and their integration.
- **Integrating Sensors with Robotic Arms (20m)**
Real example of sensor-robot communication.
- **PLC-Based Robotic Control Programming (28m)**
Programming PLCs for precise robotic movements.
- **Troubleshooting Common Automation Issues (18m)**
Problem-solving session on diagnosing faults.

Deep Dive

- **Advanced Sensor Technologies (22m)**
Exploring vision sensors, proximity sensors, and more.
- **Network Configuration and Security (20m)**
Securing PLC networks from cyber threats.
- **Data Logging and Analysis in PLCs (25m)**
Setting up data collection for performance monitoring.
- **PLC-Python Integration for Automation (30m)**
Using Python scripts to extend PLC capabilities.
- **Advanced Robotic Path Planning (28m)**
Case study on optimizing robotic trajectories.
- **Industrial IoT and PLC Systems (22m)**
Connecting PLCs to cloud platforms for remote access.
- **Fault Tolerance and Redundancy (18m)**
Implementing backup systems for critical automation.
- **Simulation and Testing Environments (25m)**
Using software simulators for PLC programming practice.

Advanced Application

- **Complex Robotic Task Automation (30m)**
Automating multi-step processes with robots.
- **PLC in Automotive Manufacturing (22m)**
Real-world application in assembly lines.
- **Custom HMI Development with SCADA (28m)**
Building advanced control interfaces.
- **Motion Control for Pick-and-Place Systems (25m)**
Hands-on guide to precision placement.
- **Sensor Fusion Techniques (20m)**
Combining multiple sensor data for better accuracy.
- **PLC-Based Quality Control Systems (22m)**
Implementing inspection automation.
- **Energy Efficiency in Automation (18m)**
Optimizing PLC programs to reduce power use.
- **Remote Monitoring and Control (25m)**
Setting up remote access for maintenance.
- **Integration with ERP Systems (30m)**
Connecting automation to business software.
- **Advanced Troubleshooting Techniques (28m)**
Deep dive into system diagnostics.
- **Case Study: Packaging Line Automation (22m)**
Step-by-step analysis of a packaging project.

- **Case Study: Robotic Welding Cell (25m)**

Real example of welding automation setup.

Implementation & Next Steps

- **Automation Project Planning (20m)**
Guide to scoping and designing projects.
- **Risk Assessment and Mitigation (18m)**
Problem-solving session on safety planning.
- **Vendor Selection and Procurement (15m)**
Choosing the right components and software.
- **Installation and Commissioning (25m)**
Hands-on guide to system setup.
- **Training and Documentation (20m)**
Creating user manuals and training materials.
- **Maintenance and Support Strategies (22m)**
Ensuring long-term system reliability.
- **Upgrading Legacy Systems (28m)**
Case study on modernizing old automation.
- **Future Trends in Automation (15m)**
Overview of AI and machine learning in PLCs.
- **Career Paths in Automation Engineering (12m)**
Guidance on professional development.
- **Final Project: Design an Automation System (30m)**
Capstone exercise to apply all learned skills.
- **Peer Review and Feedback Session (18m)**
Collaborative learning through project critiques.
- **Course Wrap-Up and Resources (10m)**
Summary and recommended further reading.
- **Next Steps: Certification and Continued Learning (12m)**
Pathways to professional certification.

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