

Automation & PLC Programming: From Sensors to Robotics

Build practical skills in industrial automation for engineers and technicians, covering PLCs, sensors, and robotic control systems.

Mechatronics Instructor: Derek Holloway • 5 sections • 48 lessons • 20.25h total

[View this course online](#) [Browse all courses](#)

About this course

Modern industry relies on automated systems that integrate sensors, PLCs, and robotics, but many professionals struggle to connect these technologies effectively. This course addresses that gap by walking you through real-world applications and common pitfalls in industrial automation. You'll learn how to program PLCs, integrate sensors, and set up robotic controls through step-by-step video lessons, hands-on case studies, and problem-solving sessions. We'll cover everything from basic electrical concepts to advanced system design, using current tools and standards relevant to 2026.

Course curriculum

Foundations and Preparation

- **Introduction to Industrial Automation Systems (18m)**
We'll start by outlining how automation fits into modern manufacturing, covering key components and their roles.
- **Basics of Programmable Logic Controllers (25m)**
This lesson explains PLC architecture, types, and selection criteria for different industrial applications.
- **Understanding Industrial Sensors (20m)**
Learn to identify common sensors like proximity, photoelectric, and temperature sensors, and their use cases.
- **Electrical Fundamentals for Automation (30m)**
Cover voltage, current, and circuit basics essential for working with control systems safely.
- **Safety Standards in Automated Environments (22m)**
Review current safety protocols and standards, including risk assessment for machinery.
- **Introduction to Control System Design (28m)**
We'll discuss how to plan simple control loops and feedback mechanisms for automated processes.
- **Programming Logic Essentials (15m)**
Get started with Boolean logic and basic programming concepts used in PLCs.
- **Setting Up Your Automation Toolkit (12m)**
A practical guide to software, hardware, and simulation tools you'll need for the course.

Core Concepts

- **Ladder Logic Programming Basics (32m)**
Step-by-step on writing and interpreting ladder diagrams for common automation tasks.
- **Structured Text and Other PLC Languages (25m)**
Explore structured text, function block diagrams, and when to use each programming method.
- **Input/Output Modules and Wiring (20m)**
Learn to connect and configure digital and analog I/O modules with real-world examples.
- **Data Handling and Memory Management (18m)**
This covers data types, variables, and memory allocation in PLC programming.
- **Using Timers and Counters Effectively (22m)**
Practical session on implementing timers and counters for sequential control.
- **Analog Signal Processing (28m)**
Work with analog inputs and outputs, including scaling and calibration techniques.
- **Communication Protocols in Automation (30m)**
Introduce protocols like Modbus, Profibus, and Ethernet/IP for device networking.
- **HMI Design and Integration (25m)**
Build human-machine interfaces that connect to PLCs for monitoring and control.
- **Troubleshooting Common PLC Issues (20m)**
Hands-on problem-solving for debugging programs and hardware faults.

- **Case Study: Building a Simple Conveyor System (35m)**
Apply learned concepts to design and program a basic conveyor control system.

Deep Dive

- **Advanced PLC Programming Techniques (30m)**
Dive into subroutines, interrupts, and error handling for complex programs.
- **Integrating Sensors with PLCs (25m)**
Step-by-step on wiring, configuring, and programming sensor inputs for accuracy.
- **Motion Control Fundamentals (28m)**
Learn the basics of servo and stepper motor control using PLCs.
- **Safety PLCs and Emergency Systems (22m)**
Cover safety-rated controllers and how to implement emergency stop functions.
- **Networked Automation Architectures (32m)**
Explore distributed control systems and networking multiple PLCs.
- **Data Logging and Analysis (20m)**
Set up data collection from sensors and PLCs for process monitoring.
- **Case Study: Sensor-Driven Packaging Line (40m)**
Real-world example of using sensors and PLCs to automate packaging tasks.

Advanced Application

- **Introduction to Robotic Integration (35m)**
How PLCs interface with industrial robots for coordinated control.
- **Programming Robot Tasks with PLCs (30m)**
Step-by-step on writing PLC programs that command robotic movements.
- **Vision Systems for Quality Control (28m)**
Integrate camera systems with PLCs for inspection and sorting applications.
- **PID Control and Process Automation (32m)**
Implement proportional-integral-derivative control for temperature and pressure.
- **SCADA Systems Overview (25m)**
Learn how SCADA complements PLCs for supervisory control and data acquisition.
- **Industrial IoT Basics (22m)**
Connect PLCs to cloud platforms for remote monitoring using current IoT standards.
- **Energy Management in Automation (18m)**
Strategies to optimize power use in automated systems with PLC programming.
- **Case Study: Setting Up a Robotic Cell (45m)**
Full walkthrough of designing and programming a robotic work cell with PLC coordination.
- **Multi-Axis Motion Coordination (30m)**
Advanced lesson on synchronizing multiple motors and axes in complex machinery.
- **Implementing Custom Function Blocks (20m)**
Create reusable code blocks to standardize automation projects.

Implementation & Next Steps

- **Project Planning for Automation Systems (25m)**
Learn to define scope, timelines, and resources for automation projects.
- **System Design and Documentation (30m)**
Create wiring diagrams, flowcharts, and PLC code documentation.
- **Installation Best Practices (22m)**
Guidelines for physically installing PLCs, sensors, and wiring safely.
- **Commissioning and Testing Procedures (35m)**
Step-by-step on validating system performance and fixing issues.
- **Maintenance and Predictive Techniques (28m)**
Set up schedules and use data for predictive maintenance in automated setups.
- **Optimization Strategies for Efficiency (20m)**
Fine-tune PLC programs and processes to improve speed and reduce waste.
- **Industry Trends and Future Technologies (18m)**
Look at emerging trends like AI integration and collaborative robotics in 2026.
- **Career Paths in Automation (15m)**
Discuss roles, certifications, and growth opportunities in industrial automation.
- **Final Project: Design a Complete Automation Line (50m)**
Apply all skills to design and program a simulated production line with sensors, PLCs, and robotics.
- **Troubleshooting Complex Integrated Systems (32m)**
Problem-solving session for issues in systems combining multiple technologies.
- **Ethical Considerations in Automation (12m)**
Brief on safety, privacy, and workforce impacts of automation technologies.
- **Building a Professional Portfolio (10m)**
Tips on showcasing your automation projects to potential employers or clients.
- **Next Steps and Continuous Learning Resources (15m)**
Recommendations for advanced courses, communities, and tools to keep skills current.

Discover our blog

Learn more with free articles written by our professors and guest experts.

Latest article: **[Flight Attendant Preparation: What to Study Before You Apply](#)**

[Visit the blog](#) [All courses](#) [This course](#)