

Mechatronics Systems Maintenance

Master Integrated Maintenance for Mechanics, Electronics, and Fluid Power Systems – For Technicians and Engineers

Mechatronics Instructor: Michael Carter • 5 sections • 52 lessons • 16.25h total

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About this course

Mechatronic systems blend mechanics, electronics, and fluid power, but maintenance teams often work in silos, causing delays and higher costs. This course solves that by teaching you to approach these systems as a whole, reducing downtime and improving reliability.

You'll learn through video lessons, real case studies, and step-by-step guides how to diagnose faults, perform repairs, and optimize performance across all three domains. The content is practical, with exercises based on common industrial scenarios.

Course curriculum

Foundations and Preparation

- **Understanding Mechatronics Systems Overview (12m)**
Get a clear introduction to how mechanics, electronics, and fluid power interact in modern machinery.
- **Identifying Core Mechanical Components (18m)**
Learn to recognize gears, bearings, and shafts, and understand their roles in system function.
- **Basics of Electronics for Maintenance (15m)**
Cover fundamental electrical concepts, circuits, and safety measures for hands-on work.
- **Introduction to Fluid Power Principles (20m)**
Explore hydraulic and pneumatic systems, including key components like pumps and valves.
- **Safety Protocols in Mechatronics Work (14m)**
Follow step-by-step safety checklists for handling electrical, mechanical, and fluid hazards.
- **Selecting and Using Maintenance Tools (16m)**
Practical guide to choosing the right tools for diagnostics and repair across all domains.
- **Reading Technical Schematics (22m)**
Decode mechanical drawings, electrical diagrams, and hydraulic circuit plans accurately.
- **Basic Diagnostic Approaches (18m)**
Learn initial troubleshooting techniques to pinpoint issues in integrated systems.

Core Concepts

- **Analyzing Mechanical Wear and Failure (20m)**
Examine common causes of mechanical breakdown and how to assess damage levels.
- **Troubleshooting Electronic Circuits (18m)**
Step-by-step guide to using multimeters and oscilloscopes for fault detection.
- **Fluid Power System Dynamics (22m)**
Understand pressure, flow, and control in hydraulic and pneumatic setups.
- **Calibrating and Integrating Sensors (15m)**
Hands-on session on aligning sensors with control systems for accurate data.
- **Maintaining Actuators and Motors (18m)**
Practical repair techniques for electric motors, hydraulic cylinders, and pneumatic actuators.
- **Fundamentals of Control Systems (20m)**
Learn how PLCs and controllers manage mechanical, electronic, and fluid components.
- **Creating Preventive Maintenance Schedules (16m)**
Build actionable maintenance plans to prevent system failures before they occur.
- **Using Data Logging for Monitoring (14m)**
Set up and interpret data from sensors to track system health over time.
- **Common Faults in Integrated Systems (22m)**
Case-based review of typical issues across mechanics, electronics, and fluid power.
- **Case Study: Industrial Robot Maintenance (25m)**
Real-world example of diagnosing and fixing a robotic arm with multiple subsystems.

Deep Dive

- **Advanced Mechanical Alignment Techniques (18m)**
Precision methods for aligning shafts and reducing vibration in complex machines.
- **PCB Inspection and Repair Skills (22m)**
Hands-on practice in identifying and fixing faults on printed circuit boards.
- **Hydraulic System Overhaul Procedures (20m)**
Complete guide to disassembling, cleaning, and reassembling hydraulic units.
- **Optimizing Pneumatic Performance (16m)**
Techniques to improve air flow efficiency and reduce leaks in pneumatic systems.
- **Motor and Drive System Servicing (24m)**
In-depth maintenance for variable frequency drives and motor assemblies.
- **PLC Programming for Diagnostics (28m)**
Write basic ladder logic to test and monitor system components automatically.
- **Managing Thermal Issues (15m)**
Identify and solve overheating problems in electronics and mechanical parts.
- **Vibration Analysis and Correction (18m)**
Use tools to detect imbalance and implement corrective actions step by step.
- **Real-World Fault Simulation Exercise (30m)**
Practice solving integrated system failures in a simulated industrial environment.

Advanced Application

- **Implementing Predictive Maintenance with IoT (22m)**
Set up IoT sensors for condition monitoring and early fault alerts.
- **Solving System Integration Challenges (18m)**
Case studies on coordinating maintenance across mechanical, electronic, and fluid subsystems.
- **Improving Energy Efficiency (20m)**
Practical adjustments to reduce power consumption in mechatronic systems.
- **Creating Custom Tools for Repairs (16m)**
Design and build specialized fixtures for unique maintenance tasks.
- **Upgrading Legacy Systems (24m)**
Step-by-step approach to modernizing older machinery with new components.
- **Case Study: CNC Machine Maintenance (28m)**
Full walkthrough of maintaining a CNC system, covering all integrated domains.
- **Controlling Fluid Contamination (15m)**
Methods to detect and prevent contamination in hydraulic and pneumatic fluids.
- **Reducing Electronic Noise (18m)**
Techniques to shield and filter signals for stable electronic performance.
- **Performing Mechanical Stress Tests (22m)**
Conduct load and stress tests to ensure mechanical components meet demands.
- **Using Automated Diagnostic Software (20m)**
Leverage software tools to analyze system data and generate repair reports.

- **Cross-Disciplinary Problem Solving (25m)**
Work through scenarios that require insights from all three maintenance areas.
- **Documenting Maintenance Activities (14m)**
Best practices for logging repairs and updates for future reference.

Implementation & Next Steps

- **Developing a Comprehensive Maintenance Plan (18m)**
Create a tailored plan for your facility, covering all subsystems.
- **Coordinating Team Maintenance Efforts (16m)**
Strategies for effective communication and role assignment in teams.
- **Managing Vendor Relationships (14m)**
Guide to sourcing parts and services while maintaining quality control.
- **Handling Emergency Repairs (22m)**
Quick-response protocols to minimize downtime during critical failures.
- **Testing and Validating Repairs (20m)**
Run functional tests to confirm repairs meet system requirements.
- **Implementing Continuous Improvement (18m)**
Use feedback loops to refine maintenance processes over time.
- **Understanding Industry Standards (15m)**
Overview of key compliance and safety standards for mechatronics.
- **Exploring Career Opportunities (12m)**
Discuss paths in maintenance engineering, system design, and more.
- **Case Study: Automotive Assembly Line (25m)**
Real example of maintaining an automated production line with integrated systems.
- **Future Trends in Mechatronics (18m)**
Look at emerging technologies and their impact on maintenance practices.
- **Building a Learning Portfolio (14m)**
Document your projects and skills for professional development.
- **Capstone Project Introduction (20m)**
Overview of a final project to apply all course concepts.
- **Course Summary and Resource List (10m)**
Recap key takeaways and provide recommended tools, books, and websites.

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