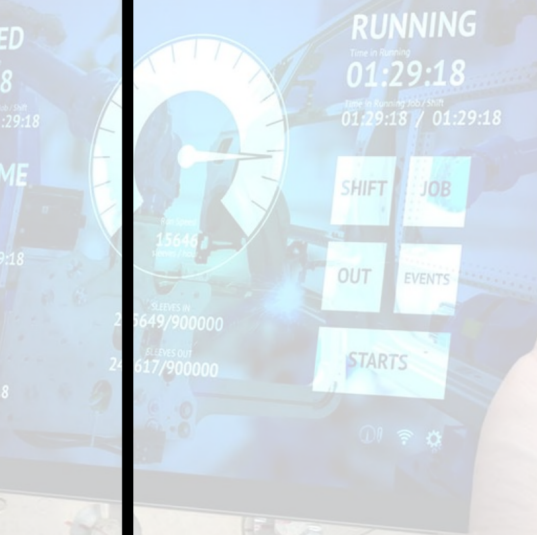


Predictive Maintenance

Master Techniques,
Technologies, and Data-
Driven Strategies



Course Outline

Maintenance Strategies	01
PdM Fundamentals	02
Data Science & ML	03
Condition Monitoring	04
Root Cause Analysis (RCA)	05
Integrating and Implementation	06
Key Performance (KPIs)	07



Course Introduction



This course on Predictive Maintenance (PdM) provides participants with a robust understanding of various maintenance strategies and their applications across industries.

From traditional preventive maintenance to advanced data-driven approaches, we'll examine different strategies and their effectiveness in different contexts.

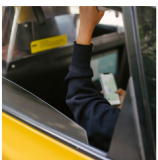
The course will equip you with the knowledge to select the most suitable maintenance approach for your specific equipment and operational needs.

Course Objectives

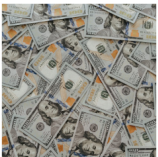
By the end of this course, participants will:



**PREDICTIVE
MAINTENANCE**



Understand different maintenance approaches such as preventive, condition-based, time-based, and predictive maintenance.



Learn how to select the appropriate maintenance type for various equipment, machines, and systems.



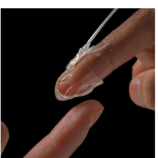
Gain insights into data science techniques relevant to predictive maintenance, including sensor data analysis, machine learning models, and failure predictions.



Master key diagnostic techniques like vibration analysis, ultrasonic monitoring, thermography, tribology, and electrical motor analysis.



Explore the use of Root Cause Analysis (RCA) to troubleshoot and mitigate recurring equipment failures.



Understand how to apply soft and hard sensors for real-time monitoring and data collection.



Learn to define and track Key Performance Indicators (KPIs) relevant to maintenance operations.

Target Audience

This course is ideal for:

Maintenance engineers and supervisors.

Plant managers and reliability engineers.

Technicians responsible for equipment monitoring and upkeep.

Data scientists and analysts working in industrial maintenance.

Professionals from industries such as manufacturing, oil and gas, energy, automotive, and aerospace.

Anyone interested in predictive maintenance technology and methodologies.





Course Syllabus

Module 1: Introduction to Maintenance Strategies

- Overview of time-based, condition-based, and predictive maintenance strategies.
- Understanding the role of maintenance in different industries and devices.
- Criteria for selecting appropriate maintenance strategies for various equipment and systems.

Module 2: Fundamentals of Predictive Maintenance

- Introduction to predictive maintenance concepts and benefits.
- Key technologies driving PdM, such as sensors, machine learning, and Internet of Things (IoT).
- Overview of condition monitoring and diagnostic tools used in PdM.

Module 3: Data Science in Predictive Maintenance

- Collection, processing, and analysis of sensor data.
- Introduction to machine learning techniques for PdM, such as Gaussian Process Regression (GPR).
- Predictive models for remaining useful life (RUL) estimation and degradation monitoring.

Module 4: Diagnostic Techniques for Condition Monitoring

- Vibration analysis: tools and methods for detecting imbalances, misalignments, and wear.
- Ultrasonic monitoring for detecting leaks, cracks, and friction issues.
- Thermography for temperature monitoring and identifying hotspots in machinery.
- Tribology and oil analysis for monitoring lubrication and wear.

Module 5: Prognostics and Failure Prediction

- Advanced techniques for failure prediction and maintenance scheduling.
- Use of data-driven models, time series analysis, and trend analysis in predicting failures.
- Practical applications of prognostics in different industries, including manufacturing and energy.

Module 6: Maintenance Decision Optimization

- Introduction to decision-making frameworks for optimizing maintenance operations.
- Cost-benefit analysis and risk assessment for maintenance planning.
- Multi-objective optimization: balancing costs, downtime, and safety in maintenance decisions.
- Case studies on effective maintenance optimization strategies.

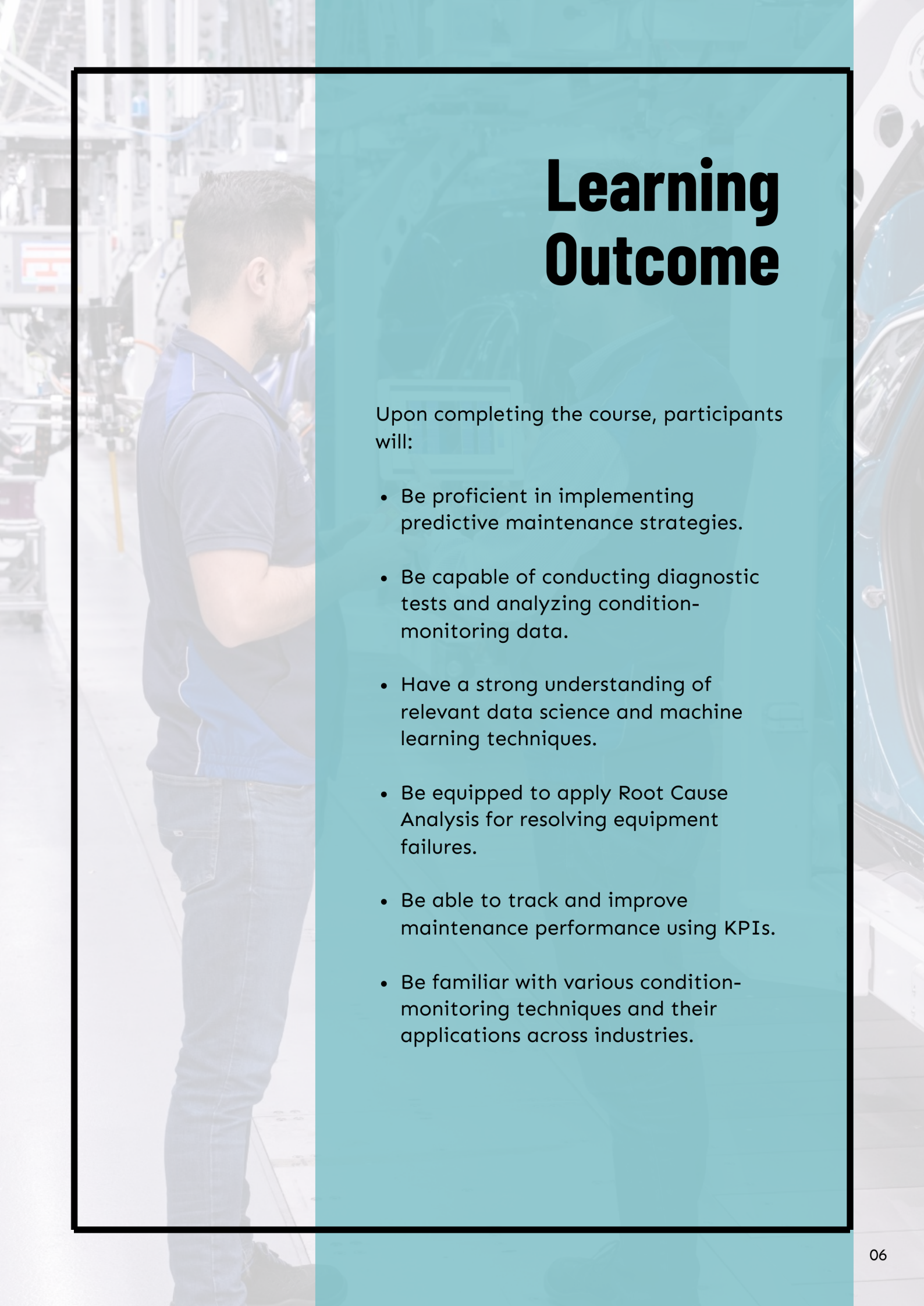
Module 7: Key Performance Indicators (KPIs) and Maintenance Implementation

- Defining and monitoring KPIs to measure the effectiveness of PdM strategies.
- Strategies for integrating predictive maintenance into existing maintenance programs.
- Final project: Designing a comprehensive PdM strategy for a chosen industry or system.

Module 7: Key Performance Indicators (KPIs) and Maintenance Implementation

- Defining and monitoring KPIs to measure the effectiveness of PdM strategies.
- Strategies for integrating predictive maintenance into existing maintenance programs.
- Final project: Designing a comprehensive PdM strategy for a chosen industry or system.





Learning Outcome

Upon completing the course, participants will:

- Be proficient in implementing predictive maintenance strategies.
- Be capable of conducting diagnostic tests and analyzing condition-monitoring data.
- Have a strong understanding of relevant data science and machine learning techniques.
- Be equipped to apply Root Cause Analysis for resolving equipment failures.
- Be able to track and improve maintenance performance using KPIs.
- Be familiar with various condition-monitoring techniques and their applications across industries.

Why Attend

- Gain a cutting-edge understanding of predictive maintenance and how it can save costs and enhance operational efficiency.
- Develop a robust skill set that integrates both maintenance engineering and data science.
- Learn from industry experts through real-world case studies and interactive learning.
- Stay ahead of the curve in predictive technologies and maintenance practices.