Training Course on Predictive Maintenance in Power Systems Using AI

Professional Development Training Course Outline

Category	Engineering	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Introduction

As power systems grow increasingly complex and digitally connected, traditional maintenance strategies are no longer sufficient to ensure reliability, efficiency, and uptime. Predictive maintenance powered by Artificial Intelligence (AI) and Machine Learning (ML) offers revolutionary potential by enabling data-driven decision-making, real-time monitoring, and failure prediction before costly downtimes occur. Training Course on Predictive Maintenance in Power Systems Using AI delves into the advanced integration of AI technologies for predictive analytics in power systems, focusing on condition-based maintenance, digital twins, and prognostics.

Designed for engineers, utility professionals, and asset managers, this course blends cutting-edge AI techniques with practical maintenance strategies. Participants will learn how to utilize sensor data, Internet of Things (IoT), deep learning models, and cloud computing to detect anomalies, assess asset health, and optimize maintenance schedules. Through interactive case studies and simulations, attendees will gain hands-on experience applying AI tools to transformers, switchgear, circuit breakers, substations, and other critical power system assets.

Programme Curriculum

Training Course on Predictive Maintenance in Power Systems Using AI

Introduction

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Course Objectives

1. Understand the fundamentals of AI and ML in predictive maintenance
2. Explore applications of AI in power system diagnostics
3. Analyze sensor and condition monitoring data
4. Implement data preprocessing and feature engineering techniques
5. Build ML models for equipment health forecasting
6. Deploy digital twins for asset lifecycle management
7. Integrate IoT frameworks with maintenance platforms
8. Utilize real-time dashboards for predictive analytics
9. Detect and classify faults before failures occur
10. Optimize asset management strategies using AI insights
11. Ensure cost-effective scheduling of maintenance tasks
12. Align predictive maintenance with reliability-centered maintenance (RCM)
13. Evaluate ROI and performance of AI-driven maintenance systems

Organizational Benefits

1. Reduced unplanned outages and downtime
2. Extended lifespan of power system assets
3. Lower maintenance and operational costs
4. Enhanced asset health visibility through AI dashboards
5. Increased energy efficiency and reliability
6. Streamlined maintenance planning and scheduling
7. Early fault detection and prevention
8. Improved workforce safety and decision-making
9. Competitive edge through AI-enabled innovation
10. Compliance with predictive maintenance best practices and standards

Target Participants

- Electrical and Power System Engineers
- Maintenance and Asset Managers

- Utility Company Professionals
- Energy Analysts and Planners
- AI/ML Engineers in Energy Sector
- Smart Grid and SCADA Specialists
- Substation and Plant Managers
- IoT Application Developers in Energy
- Consultants and Technical Trainers
- Graduate Students in Electrical or Data Science

Course Outline

Module 1: Introduction to Predictive Maintenance

1. Evolution from preventive to predictive maintenance
2. Benefits and challenges of predictive maintenance
3. Maintenance KPIs and performance indicators
4. Overview of power system equipment failures
5. Case Study: Downtime reduction in a substation

Module 2: Fundamentals of Artificial Intelligence and Machine Learning

1. AI/ML concepts and terminology
2. Supervised vs unsupervised learning
3. ML algorithms: regression, classification, clustering
4. Deep learning basics for signal and image processing
5. Case Study: Transformer failure prediction using ML

Module 3: Sensor Technologies and Data Acquisition

1. Condition monitoring sensors (temperature, vibration, partial discharge)
2. Data acquisition systems (DAQs)
3. IoT-based sensor networks
4. Wireless data transmission in substations
5. Case Study: Vibration monitoring in circuit breakers

Module 4: Data Preprocessing and Feature Engineering

1. Data cleaning and normalization
2. Time-series feature extraction
3. Principal Component Analysis (PCA)
4. Signal denoising and transformation
5. Case Study: Preparing sensor data for ML model

Module 5: Machine Learning Model Development

1. Model training and testing workflows
2. Cross-validation techniques
3. Hyperparameter tuning
4. Model performance metrics (RMSE, accuracy, F1-score)
5. Case Study: Predicting battery degradation using ML

Module 6: Deep Learning Applications in Predictive Maintenance

1. Introduction to neural networks and CNNs
2. LSTM for time-series predictions

3. Anomaly detection using autoencoders
4. Model deployment using TensorFlow and PyTorch
5. Case Study: Deep learning for motor fault detection

Module 7: Digital Twin Technology

1. Digital twin concept and architecture

2. Upcoming Scheduled Sessions

Start Date	End Date	Location	Price
23 Nov 2026	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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