AI in Smart Manufacturing and Predictive Maintenance Training Course



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4100 € (Per Person)

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Course Introduction / Overview:

This course provides a comprehensive exploration of Artificial Intelligence (AI) applications within the modern manufacturing landscape, with a specialized focus on developing robust predictive maintenance strategies. As industries transition towards the Industry 4.0 paradigm, the ability to leverage data for proactive decision-making is no longer an advantage but a necessity. This program is designed to demystify the concepts of machine learning, industrial IoT, and data analytics, translating complex theories into practical, actionable skills. We delve into the methodologies championed by leading academics like Dr. Jay Lee, a distinguished scholar in industrial AI and prognostics, whose work in books such as "Industrial AI: Applications with Sustainable Performance" has shaped the field. Participants will learn to build and deploy AI models that can predict equipment failure, optimize maintenance schedules, and enhance overall operational efficiency. At BIG BEN Training Center, we are committed to equipping professionals with the forward-thinking expertise required to transform traditional manufacturing floors into intelligent, self-aware smart factories, thereby minimizing downtime and maximizing productivity. This journey covers everything from foundational data principles to the strategic implementation of AI-driven systems.

Target Audience / This training course is suitable for:

- Maintenance Managers and Reliability Engineers.
- Production and Operations Supervisors.
- Industrial, Mechanical, and Electrical Engineers.
- Data Scientists and Analysts working in industrial sectors.
- Plant Managers and Operations Directors.
- IT Professionals supporting manufacturing systems.
- Quality Assurance and Control Specialists.
- Process Improvement and Lean Manufacturing Practitioners.

Target Sectors and Industries:

- Automotive and Aerospace Manufacturing.
- Pharmaceutical and Chemical Processing.
- Food and Beverage Production.
- Electronics and Semiconductor Manufacturing.
- Heavy Machinery and Industrial Equipment.
- Oil, Gas, and Energy sectors.
- Consumer Packaged Goods (CPG).
- Governmental bodies and public sector agencies overseeing industrial regulation and development.

Target Organizations Departments:

- Maintenance and Reliability Department.
- Operations and Production Department.
- Engineering and Technical Services.
- Quality Assurance and Quality Control (QA/QC).
- Information Technology (IT) and Data Analytics.
- Supply Chain and Logistics Management.
- Research and Development (R&D).
- Continuous Improvement and Operational Excellence Teams.

Course Offerings:

By the end of this course, the participants will have able to:

- Understand the fundamental concepts of AI, machine learning, and their role in Industry 4.0.
- Identify and source relevant data from industrial equipment and manufacturing execution systems.
- Apply data pre-processing and feature engineering techniques to sensor and operational data.
- Develop and train machine learning models for failure prediction and anomaly detection.
- Calculate the Remaining Useful Life (RUL) of critical industrial assets.
- Design a comprehensive, data-driven predictive maintenance strategy.
- Integrate AI solutions with existing Computerized Maintenance Management Systems (CMMS).
- Evaluate the performance and accuracy of predictive models in a real-world context.
- Build a compelling business case and calculate the ROI for AI implementation in manufacturing.
- Recognize the ethical considerations and future trends of AI in the industrial sector.

Course Methodology:

The training methodology at BIG BEN Training Center is designed to be immersive, practical, and highly interactive, ensuring that participants can translate theoretical knowledge into tangible skills. This course moves beyond traditional lectures by incorporating a blended learning approach. Each session combines expert-led instruction with hands-on workshops where participants work with real-world manufacturing datasets to build and test predictive models. We utilize a variety of case studies from diverse industries such as automotive, aerospace, and pharmaceuticals to illustrate the successful implementation of AI and predictive maintenance. Collaborative group discussions and problem-solving exercises are central to our approach, encouraging participants to share insights and tackle complex challenges as a team. The curriculum is structured to build skills progressively, culminating in a capstone project where participants design a complete predictive maintenance implementation plan for a model factory. Continuous feedback from the instructor ensures a deep understanding of the material and its practical application, empowering attendees to return to their organizations ready to lead and execute impactful AI initiatives.

Course Agenda (Course Units):

Unit One: Foundations of AI in Smart Manufacturing

- Introduction to Industry 4.0 and the Smart Factory.
- Core Concepts of Artificial Intelligence, Machine Learning, and Deep Learning.
- Types of Manufacturing Data (Sensor, MES, CMMS).
- The Role of IoT and Edge Computing in Industrial Data Acquisition.
- Understanding the Predictive Maintenance Maturity Model.
- Data Governance and Quality for Industrial AI.
- Key Performance Indicators (KPIs) for Maintenance and Production.

Unit Two: Data Preparation and Feature Engineering for Industrial Data

- The Data Science Lifecycle in a Manufacturing Context.
- Techniques for Cleaning and Pre-processing Sensor Data.
- Handling Missing Values and Outliers in Time-Series Data.
- Feature Engineering for Predictive Maintenance Models.
- Exploratory Data Analysis (EDA) for Gaining Insights.
- Data Visualization Techniques for Industrial Processes.
- Tools and Platforms for Industrial Data Management.

Unit Three: Building Machine Learning Models for Predictive Maintenance

- Supervised vs. Unsupervised Learning for Maintenance Applications.
- Regression Models for Predicting Remaining Useful Life (RUL).
- Classification Models for Failure Pattern Recognition.
- Anomaly Detection Algorithms for Early Warning Signals.
- Introduction to Deep Learning Models like LSTMs for Time-Series Forecasting.
- Model Training, Validation, and Testing Strategies.
- Evaluating Model Performance with Metrics like Accuracy, Precision, and Recall.

Unit Four: Implementing and Deploying AI-Driven Systems

- Architecting an End-to-End Predictive Maintenance Solution.
- Integrating AI Models with CMMS and Enterprise Asset Management (EAM) Systems.
- Deployment Strategies: Cloud, On-Premise, and Edge Computing.
- Model Monitoring and Management in a Production Environment.
- Developing User-Friendly Dashboards for Maintenance Teams.
- Change Management and Training for Adopting New AI Tools.
- Ensuring Cybersecurity for Connected Industrial Systems.

Unit Five: Advanced Applications and Strategic Vision

- AI for Root Cause Analysis (RCA) and Process Optimization.
- Using Computer Vision for AI-Driven Quality Control and Inspection.
- The Concept and Application of Digital Twins in Manufacturing.
- Optimizing Supply Chains with AI and Machine Learning.
- Building a Business Case and Calculating ROI for AI Projects.
- Ethical Considerations and the Future of Work in Automated Factories.
- Developing a Strategic Roadmap for AI Adoption in Your Organization.

FAQ:

Qualifications required for registering to this course?

There are no requirements.

How long is each daily session, and what is the total number of training hours for the course?

This training course spans five days, with daily sessions ranging between 4 to 5 hours, including breaks and interactive activities, bringing the total duration to 20 - 25 training hours.

Something to think about:

As AI-driven automation becomes more prevalent in manufacturing, what is the evolving role of the human workforce, and how can organizations proactively manage this transition to foster collaboration between humans and intelligent systems rather than displacement?

What unique qualities does this course offer compared to other courses?

This training course distinguishes itself by offering a holistic and strategic perspective on AI in manufacturing, moving far beyond a purely technical or tool-based approach. While other programs may focus narrowly on algorithms, our curriculum is built around the entire implementation lifecycle, from initial data strategy to calculating the final return on investment. We emphasize the critical link between technology and business outcomes, equipping participants with the skills to not only build a predictive model but also to champion its adoption within their organization. The course content is uniquely structured to cover both the depth of predictive maintenance and the breadth of other high-impact AI applications, such as quality control and supply chain optimization, providing a comprehensive view of the smart factory ecosystem. By integrating real-world case studies and a capstone project focused on strategic planning, we ensure that learning is practical and directly applicable. This approach transforms participants from passive learners into strategic thinkers capable of leading digital transformation initiatives and driving measurable improvements in operational efficiency and reliability.