AI Applications in Electrical Grid Management (Maintenance, Control and Operation) Training Course

Professional Development Training Course Outline

Category	Artificial Intelligence And Block Chain	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

The rapid evolution of Artificial Intelligence (AI) is transforming the way modern electrical power systems are managed, monitored, and maintained. As power grids become increasingly complex due to the integration of renewable energy sources, distributed generation, electric vehicles, and smart grid technologies, utility companies and grid operators are adopting AI-driven solutions to improve reliability, efficiency, resilience, and operational performance. AI technologies such as machine learning, deep learning, predictive analytics, computer vision, digital twins, and intelligent automation are enabling proactive decision-making and real-time optimization across the power system value chain.

AI Applications in Electrical Grid Management Training Course provides participants with practical knowledge and hands-on understanding of AI applications in electrical grid maintenance, control, and operations. Participants will explore how AI can support predictive maintenance, fault detection, load forecasting, renewable energy integration, grid stability management, asset performance optimization, cybersecurity, and autonomous grid operations. Through industry case studies and practical examples, learners will gain insights into implementing AI-powered solutions that enhance grid reliability, reduce operational costs, and support the transition toward intelligent and sustainable power systems.

Programme Curriculum

AI Applications in Electrical Grid Management (Maintenance, Control and Operation) Training Course

Introduction

The rapid evolution of Artificial Intelligence (AI) is transforming the way modern electrical power systems are managed, monitored, and maintained. As power grids become increasingly complex due to the integration of renewable energy sources, distributed generation, electric vehicles, and smart grid technologies, utility companies and grid operators are adopting AI-driven solutions to improve reliability, efficiency, resilience, and operational performance. AI technologies such as machine learning, deep learning, predictive analytics, computer vision, digital twins, and intelligent automation are enabling proactive decision-making and real-time optimization across the power system value chain.

AI Applications in Electrical Grid Management Training Course provides participants with practical knowledge and hands-on understanding of AI applications in electrical grid maintenance, control, and operations. Participants will explore how AI can support predictive maintenance, fault detection, load forecasting, renewable energy integration, grid stability management, asset performance optimization, cybersecurity, and autonomous grid operations. Through industry case studies and practical examples, learners will gain insights into implementing AI-powered solutions that enhance grid reliability, reduce operational costs, and support the transition toward intelligent and sustainable power systems.

Course Duration

10 Days

Course Objectives

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

1. Understand the fundamentals of AI and machine learning in power systems.
2. Identify opportunities for AI implementation in electrical grid operations.
3. Apply AI techniques for predictive maintenance of grid assets.
4. Utilize machine learning models for load forecasting and demand prediction.
5. Implement AI-based fault detection and outage management systems.
6. Evaluate AI applications for renewable energy forecasting and integration.
7. Analyze AI solutions for grid stability and operational optimization.
8. Develop strategies for AI-driven asset management and lifecycle optimization.
9. Assess cybersecurity risks and AI-enabled protection mechanisms in smart grids.
10. Design AI implementation roadmaps for modern electrical utilities and grid operators.

Course Outline

Module 1: Introduction to AI in Electrical Grid Management

- Fundamentals of Artificial Intelligence and Machine Learning
- Digital Transformation in Power Systems
- Evolution of Smart Grids and Intelligent Utilities
- AI Technologies Applicable to Electrical Networks
- Opportunities and Challenges of AI Adoption
- Case Study: AI transformation journey of a national utility company

Module 2: Data Analytics and AI Foundations for Power Systems

- Power System Data Sources and Infrastructure
- Big Data Analytics in Electrical Grids
- Data Quality, Cleaning, and Preparation
- Machine Learning Fundamentals for Utilities

- AI Model Development Lifecycle
- Case Study: Building a utility-wide data analytics platform for grid intelligence

Module 3: AI-Driven Predictive Maintenance of Grid Assets

- Predictive Maintenance Concepts
- Condition Monitoring of Transformers and Substations
- AI-Based Asset Health Assessment
- Remaining Useful Life (RUL) Prediction
- Maintenance Scheduling Optimization
- Case Study: Transformer failure prediction using machine learning

Module 4: Intelligent Fault Detection and Outage Management

- Power System Fault Classification
- AI-Based Fault Detection Techniques
- Automated Fault Localization
- Outage Prediction and Restoration Planning
- Self-Healing Grid Concepts
- Case Study: AI-assisted outage management system implementation

Module 5: AI Applications in Load Forecasting and Demand Management

- Short-Term Load Forecasting
- Medium and Long-Term Demand Forecasting
- Consumer Behavior Analytics
- Demand Response Optimization
- Peak Load Management Using AI
- Case Study: Machine learning-based demand forecasting for a metropolitan utility

Module 6: Renewable Energy Forecasting and Grid Integration

- Challenges of Renewable Energy Integration
- Solar Generation Forecasting Using AI
- Wind Power Prediction Models
- Energy Storage Optimization
- AI for Grid Flexibility and Balancing
- Case Study: Renewable energy forecasting for grid stability enhancement

Module 7: AI-Based Grid Control and Operational Optimization

- Real-Time Grid Monitoring
- AI for Voltage and Frequency Control
- Intelligent Dispatch and Resource Allocation
- Autonomous Grid Operations
- Decision Support Systems for Operators
- Case Study: AI-enabled control center for transmission system operations

Module 8: Digital Twins and Intelligent Asset Management

- Digital Twin Concepts in Power Systems
- Virtual Asset Modeling

- AI-Powered Asset Performance Management
- Lifecycle Cost Optimization
- Infrastructure Investment Planning
- Case Study: Digital twin implementation for transmission network management

Module 9: AI for Smart Grid Cybersecurity and Resilience

- Cybersecurity Threats in Modern Power Grids
- AI-Based Threat Detection Systems
- Anomaly Detection in Grid Networks
- Resilience Enhancement through AI
- Incident Response and Recovery Automation
- Case Study: AI-powered cybersecurity monitoring for utility infrastructure

Module 10: Future Trends and AI Implementation Strategy

- Emerging AI Technologies in Energy Systems
- Generative AI Applications in Utility Operations
- Regulatory and Ethical Considerations
- AI Project Planning and Governance
- Developing an AI Roadmap for Grid Modernization
- Case Study: Developing an enterprise AI strategy for a national power utility

Training Methodology

- Interactive instructor-led sessions
- Hands-on practical exercises and labs
- Real-world case study simulations
- Group activities and peer learning
- Quizzes and post-module assessments

Register as a group from 3 participants for a Discount

Send us an email: info@fineskilltrainingcenter.org or call *+254769199797*

Certification

Upon successful completion of this training, participants will be issued with a globally- recognized certificate.

Tailor-Made Course

We also offer tailor-made courses based on your needs.

Key Notes

a. The participant must be conversant with English.

b. Upon completion of training the participant will be issued with an Authorized Training Certificate

c. Course duration is flexible and the contents can be modified to fit any number of days.

d. The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

e. One-year post-training support Consultation and Coaching provided after the course.

f. Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

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

Ready to enroll or request a customized program? Book online or contact us:

Register Online Now

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com