

AI in Electrical Engineering

Professional Training Course

Skillslab Training Provider

Skills for Tomorrow's World 



Course Description

Introduction

The AI in Electrical Engineering training course is a forward-looking professional development program designed to equip electrical engineers, technical managers, maintenance leaders, project professionals, and decision-makers with the knowledge required to apply artificial intelligence across electrical systems, power networks, industrial facilities, and engineering operations.

Electrical engineering environments generate large volumes of operational data from power equipment, protection systems, sensors, control devices, substations, industrial machinery, and energy management platforms. Artificial intelligence enables organizations to transform this data into predictive insights, automated decisions, improved asset performance, and more reliable engineering outcomes.

This course explores how artificial intelligence, machine learning, predictive analytics, intelligent automation, digital monitoring, and data-driven engineering can support electrical design, condition assessment, fault detection, predictive maintenance, power system optimization, energy efficiency, and operational risk management.

Participants will examine practical AI applications across generation, transmission, distribution, industrial electrical systems, renewable energy integration, smart grids, and electrical asset management. The program focuses on strategic and operational implementation rather than advanced programming, making it suitable for both engineering professionals and technical leaders.

The executive-level value proposition of this course is its ability to help organizations improve electrical reliability, reduce unplanned downtime, optimize maintenance expenditure, enhance energy performance, strengthen safety, and extend the useful life of critical assets. Participants will develop a structured approach for identifying valuable AI opportunities and converting them into practical engineering initiatives with measurable organizational impact.

Course Objectives

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

- Understand the role of artificial intelligence in modern electrical engineering.
- Distinguish between artificial intelligence, machine learning, predictive analytics, intelligent automation, and digital monitoring.
- Identify high-value AI applications across electrical engineering operations.
- Use data-driven approaches to support engineering analysis and decision-making.
- Explore AI applications in electrical design and system optimization.
- Apply predictive concepts to electrical maintenance and asset management.
- Improve fault detection, diagnosis, and equipment condition assessment.
- Evaluate AI-supported solutions for power system monitoring and protection.
- Understand how AI can improve energy efficiency and load management.
- Explore intelligent applications in renewable energy and smart grid environments.
- Assess organizational data readiness for engineering AI initiatives.
- Evaluate technology providers, software platforms, and implementation partners.
- Develop business cases for AI investment in electrical engineering.
- Address safety, cybersecurity, data quality, and governance considerations.
- Prepare a phased implementation roadmap for AI-enabled electrical operations.

Course Content

Day 1: Artificial Intelligence in Modern Electrical Engineering

- Understanding artificial intelligence from an electrical engineering perspective.
- The evolution of electrical systems from conventional monitoring to intelligent operation.
- Differences between artificial intelligence, machine learning, predictive analytics, automation, and optimization.
- Major AI trends affecting power systems and industrial electrical operations.
- The role of engineering data in AI-supported decision-making.

- Sources of electrical data from sensors, meters, protection relays, control systems, and equipment.
- Identifying engineering problems suitable for AI solutions.
- Benefits and limitations of AI in electrical applications.
- Understanding supervised, unsupervised, and predictive learning concepts.
- The role of human engineering judgment in AI-supported decisions.
- Common barriers to AI adoption in technical organizations.
- Reviewing real-world AI applications in electrical engineering.
- Practical exercise: mapping AI opportunities across electrical systems and assets.

Day 2: AI in Electrical Design, Analysis, and System Optimization

- Applying AI to electrical engineering design processes.
- Supporting load estimation and demand analysis.
- Intelligent cable sizing and equipment selection concepts.
- AI-assisted design review and technical document analysis.
- Detecting inconsistencies in engineering drawings and specifications.
- Supporting power flow and system performance analysis.
- Improving voltage control and reactive power management.
- Optimizing electrical network configuration.
- AI applications in short-circuit and contingency analysis.
- Supporting protection coordination and relay setting assessment.
- Using intelligent tools for engineering calculations and technical reporting.
- Improving design quality, consistency, and review efficiency.
- Limitations of automated engineering recommendations.
- Practical workshop: evaluating an AI-supported electrical design and analysis use case.

Day 3: Predictive Maintenance and Electrical Asset Management

- Moving from corrective and preventive maintenance to predictive maintenance.
- AI applications in electrical asset condition monitoring.

- Collecting and analysing equipment health data.
- Predicting failures in transformers, switchgear, motors, generators, cables, and circuit breakers.
- Using temperature, vibration, current, voltage, and insulation data.
- Detecting abnormal operating patterns and early warning indicators.
- AI-supported fault diagnosis and root cause identification.
- Estimating equipment health and remaining useful life.
- Optimizing inspection and maintenance schedules.
- Prioritizing maintenance based on asset criticality and risk.
- Reducing unplanned outages and maintenance costs.
- Integrating AI insights with computerized maintenance systems.
- Developing intelligent asset health indicators.
- Case study: predicting the failure of a critical electrical asset.

Day 4: AI in Power Systems, Smart Grids, and Energy Management

- AI applications across power generation, transmission, and distribution.
- Intelligent load forecasting and demand prediction.
- Grid stability monitoring and operational decision support.
- Detecting network disturbances, faults, and power quality issues.
- AI-supported outage prediction and restoration planning.
- Improving distribution network reliability.
- Intelligent demand-side management.
- Energy consumption forecasting and optimization.
- Identifying energy losses and inefficient operating patterns.
- AI applications in renewable energy forecasting.
- Supporting solar and wind power integration.
- Battery energy storage optimization.
- Electric vehicle charging and load management.
- Smart grid monitoring and distributed energy resources.

- Practical exercise: developing an AI-supported energy optimization scenario.

Day 5: AI Governance, Cybersecurity, and Implementation Roadmap

- Aligning AI initiatives with electrical engineering and organizational priorities.
- Prioritizing use cases based on value, feasibility, safety, and risk.
- Assessing data quality, availability, accuracy, and ownership.
- Developing a business case for AI-enabled electrical engineering.
- Estimating implementation costs, savings, reliability gains, and expected value.
- Defining performance indicators for AI initiatives.
- Evaluating engineering software, AI platforms, and technology providers.
- Determining whether to build, buy, customize, or outsource solutions.
- Integrating AI with existing electrical, maintenance, monitoring, and control systems.
- Managing cybersecurity risks in connected electrical environments.
- Protecting operational technology and sensitive engineering data.
- Establishing human oversight and technical accountability.
- Addressing safety, reliability, ethical, and regulatory considerations.
- Moving from pilot projects to operational deployment.
- Managing organizational change and workforce capability development.
- Final workshop: developing an AI implementation roadmap for electrical engineering operations.

Target Audience

This course is designed for professionals involved in electrical engineering, power systems, industrial operations, maintenance, energy management, and technical transformation, including:

- Electrical engineers.
- Power systems engineers.
- Electrical design engineers.
- Maintenance engineers and managers.
- Reliability and asset management professionals.

- Protection and control engineers.
- Instrumentation and control professionals.
- Electrical project managers.
- Technical and engineering managers.
- Plant and facility engineers.
- Energy managers and specialists.
- Renewable energy professionals.
- Utility and grid operations professionals.
- Substation engineers and supervisors.
- Industrial automation professionals.
- Engineering consultants.
- Digital transformation leaders.
- Data and technology professionals supporting engineering functions.
- Government and public-sector technical officials.
- Executives responsible for engineering performance, reliability, and energy efficiency.

Course Requirements

Participants are expected to have:

- A general background in electrical engineering, power systems, maintenance, energy, or technical management.
- A basic understanding of electrical equipment and operational processes.
- Awareness of common electrical reliability, maintenance, or energy challenges.
- An interest in artificial intelligence, predictive analytics, and digital transformation.
- Access to a laptop or suitable digital device for practical activities.
- Willingness to participate in discussions, case studies, and group exercises.

No advanced programming or data science experience is required. The course explains AI concepts in practical engineering language and focuses on their operational and strategic application.

Participants are encouraged to bring examples of electrical engineering or maintenance challenges from their organizations for discussion during the practical workshops.

Training Methodology

The course uses an interactive and application-focused training methodology that connects artificial intelligence concepts with real electrical engineering requirements.

The training methodology includes:

- Expert-led technical presentations.
- Facilitated engineering discussions.
- Real-world electrical and power system case studies.
- Practical demonstrations of AI-supported applications.
- Electrical data interpretation exercises.
- Fault detection and condition assessment scenarios.
- Predictive maintenance workshops.
- Power system and energy optimization activities.
- Asset criticality and risk assessment exercises.
- Technology and vendor evaluation activities.
- Business case development exercises.
- Individual and group assignments.
- Peer learning and professional experience sharing.
- Sector-specific discussions aligned with participant responsibilities.
- Development of a practical AI implementation roadmap.

The methodology emphasizes practical application, engineering reliability, measurable operational improvement, and the immediate transfer of learning to the workplace.

Learning Outcomes

Upon successful completion of the course, participants will be able to:

- Explain how artificial intelligence is transforming electrical engineering.
- Identify suitable AI applications across electrical systems and operations.
- Evaluate the data requirements of AI-enabled engineering solutions.
- Use AI-supported concepts to improve electrical design and analysis.
- Identify early indicators of electrical equipment failure.
- Apply predictive maintenance principles to critical electrical assets.
- Improve fault detection, diagnosis, and condition assessment.
- Support more effective maintenance planning and resource allocation.
- Evaluate AI applications in power system monitoring and protection.
- Improve load forecasting and energy management decisions.
- Identify opportunities to improve energy efficiency and reduce electrical losses.
- Understand AI applications in renewable energy and smart grids.
- Develop credible business cases for AI investment.
- Evaluate software platforms, solution providers, and implementation proposals.
- Address safety, cybersecurity, governance, and data quality risks.
- Maintain appropriate engineering oversight of AI-generated recommendations.
- Develop a practical roadmap for intelligent, reliable, and efficient electrical engineering operations.

Instructor Profile

The course will be delivered by an internationally certified expert with extensive practical and consulting experience.

The instructor possesses strong expertise in artificial intelligence, electrical engineering, power systems, predictive maintenance, asset management, energy optimization, reliability engineering, smart grids, digital transformation, and operational technology.

The instructor's approach combines strategic insight with practical engineering experience, enabling participants to understand advanced concepts in clear professional language and apply them effectively within government entities, ministries, utilities, industrial organizations, public-sector institutions, and large

corporations.

Contact Us

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