Resilient Energy Infrastructure Training Course

Professional Development Training Course Outline

Category	Renewable Energy	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Resilient Energy Infrastructure Training Course equips professionals with the knowledge and practical capabilities required to design, operate, protect, and modernize reliable, sustainable, climate-resilient, and digitally enabled energy systems. As electricity networks face increasing pressure from extreme weather, renewable-energy integration, cyber risks, aging infrastructure, electrification, distributed energy resources (DERs), and rising electricity demand, resilience is becoming a core infrastructure priority. Modern solutions increasingly combine renewable energy, battery energy storage, microgrids, smart grids, advanced power electronics, demand response, digital twins, artificial intelligence (AI), predictive analytics, and automated restoration to improve reliability and reduce outage impacts. Recent research highlights digital twins, AI-driven forecasting, satellite-assisted monitoring, IoT, and adaptive control as emerging tools for hazard-resilient power systems.

The course provides a strategic and technical framework for energy resilience planning, risk assessment, infrastructure hardening, renewable integration, emergency preparedness, grid modernization, cybersecurity, and rapid recovery. Participants explore how decentralized energy resources, networked microgrids, virtual power plants, energy storage, intelligent monitoring, and self-healing grid architectures can strengthen critical infrastructure and maintain essential services during disruptions. The growing deployment of variable wind and solar generation also makes flexibility, forecasting, storage, and grid modernization increasingly important for system stability. Through practical exercises and case-based learning, participants develop actionable resilience strategies that balance energy security, affordability, sustainability, reliability, climate adaptation, and operational continuity.

Programme Curriculum

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Course Duration

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Course Objectives

By the end of the training, participants will be able to:

1. Understand the principles of energy infrastructure resilience, reliability, sustainability, and energy security.
2. Assess climate, natural-hazard, operational, physical, and cyber risks affecting energy infrastructure.
3. Develop climate-resilient and disaster-resilient energy infrastructure strategies.
4. Apply risk assessment, vulnerability analysis, resilience metrics, and scenario planning.
5. Design resilient microgrids and distributed energy resource (DER) architectures.
6. Evaluate the role of solar PV, wind power, battery energy storage, and hybrid renewable systems in resilience planning.
7. Apply smart-grid, grid-modernization, automation, and self-healing grid concepts.
8. Use AI, machine learning, digital twins, IoT, predictive analytics, and real-time monitoring for resilience enhancement.
9. Develop energy emergency preparedness, business continuity, and disaster recovery frameworks.
10. Strengthen critical infrastructure protection and energy cybersecurity capabilities.
11. Evaluate grid flexibility, demand response, virtual power plants, and energy management systems.
12. Develop investment and implementation strategies using resilience economics, lifecycle costing, and risk-informed decision-making.
13. Create an integrated resilient energy infrastructure action plan aligned with sustainability, decarbonization, and long-term energy-transition objectives.

Target Audience

1. Energy engineers and electrical engineers

2. Utility executives and managers
3. Renewable-energy and microgrid professionals
4. Infrastructure and facilities managers.
5. Government officials, regulators, and policymakers
6. Project developers, consultants, and investment professionals
7. Emergency management, disaster-risk, and business-continuity professionals
8. Researchers, academics, sustainability professionals, and technical specialists

Training Modules

Module 1: Foundations of Resilient Energy Infrastructure

- Energy resilience fundamentals
- Infrastructure vulnerability
- Threat landscape
- Resilience metrics
- **Case study:** Analysis of how extreme weather can expose weaknesses in centralized power infrastructure and how decentralized resources can improve continuity.

Module 2: Climate Risk, Hazard Assessment & Infrastructure Hardening

- Climate-risk assessment
- Hazard-informed planning
- Climate-proofing
- Risk-based asset management
- **Case study:** Climate-proofing power infrastructure through renewable penetration, decentralization, and targeted resilience investments.

Module 3: Renewable Energy, DERs & Energy Storage

- Renewable integration
- Distributed energy resources
- Battery energy storage systems (BESS)
- Forecasting and flexibility
- **Case study:** A high-renewable microgrid using **PV + battery storage + intelligent energy management** to maintain critical-load supply during grid interruptions.

Module 4: Microgrids, Islanding & Self-Healing Networks

- Microgrid architecture
- Islanding and black-start concepts
- Networked microgrids.
- Self-healing grids
- **Case study:** Community resilience hubs and microgrids providing critical electricity during grid outages

Module 5: Smart Grids, AI, Digital Twins & Advanced Analytics

- Smart-grid technologies
- Artificial intelligence and machine learning
- Digital twins
- IoT and edge-cloud technologies

- **Case study:** A **climate-aware digital twin** combining AI forecasting, IoT data, and hazard information to support predictive grid management and faster restoration.

Module 6: Energy Cybersecurity & Critical Infrastructure Protection

- Cybersecurity fundamentals
- Cyber-physical risk
- Defense-in-depth
- Critical infrastructure protection
- **Case study:** Developing a cyber-resilience framework for a smart-grid environment where increased digitalization creates new cybersecurity and interoperability challenges.

Module 7: Emergency Response, Business Continuity & Disaster Recovery

- Emergency preparedness
- Business continuity
- Outage management
- Resilient recovery
- **Case study:** Urban resilience planning using **microgrid partitioning, mobile energy storage, remote switching, and data-driven risk assessment** to improve emergency response and restoration.

Module 8: Resilience Strategy, Investment & Future Energy Systems

- Resilience investment planning
- Energy-transition strategy
- Resilience roadmaps
- Future-ready infrastructure.
- **Caase study:** Designing an integrated resilient energy strategy for a city or industrial zone combining **renewables, storage, microgrids, smart-grid automation, AI analytics, cybersecurity, and emergency-response planning**.

Training Methodology

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

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	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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