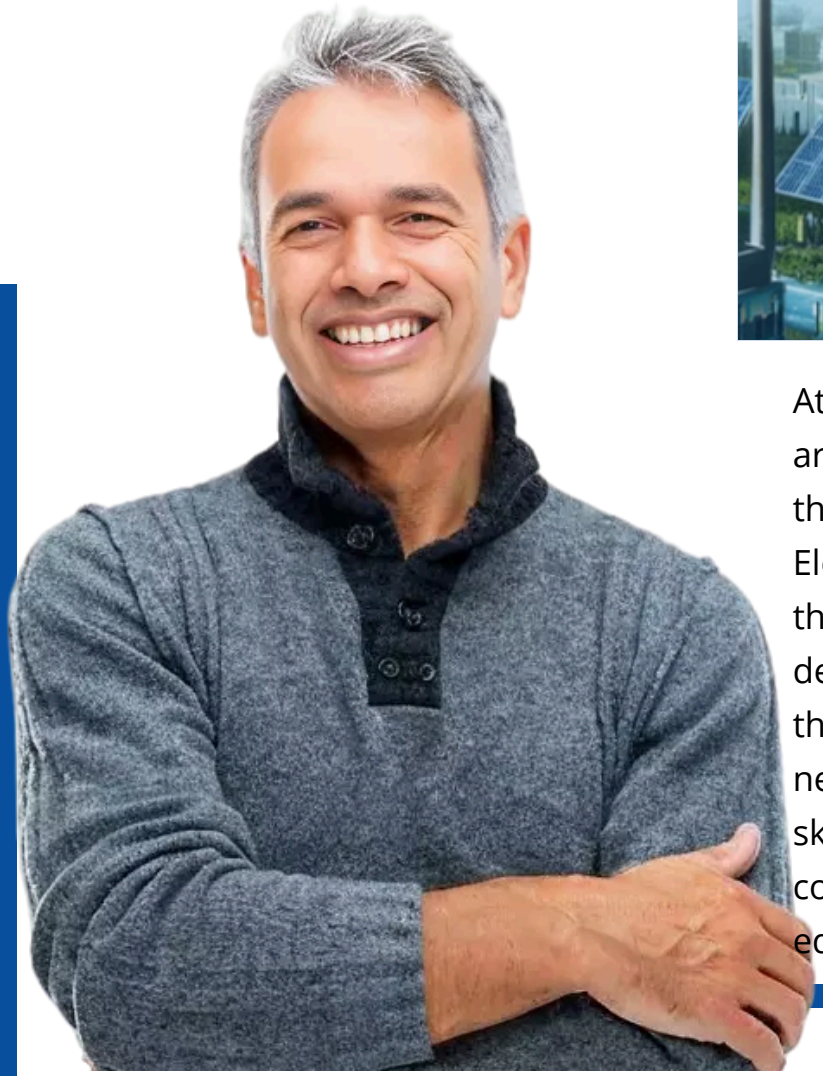
ELP

ENGINEERS' CERTIFICATION PROGRAM

Engineering Skills

Grid Integration

Challenges and Solutions for Renewable Energy



At Electrical Learning Portal (ELP), we are dedicated to shaping the future of the electrical and MEP (Mechanical, Electrical, and Plumbing) industries through professional training and development. Our mission is to bridge the gap between the ever-evolving needs of employers and the dynamic skill set of engineers by providing comprehensive, industry-relevant education and training.

Degree + Skills = Career Growth

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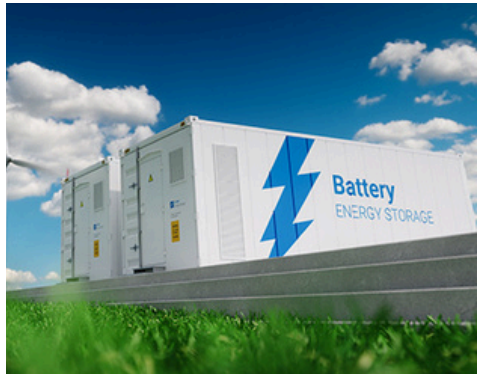
GRID INTEGRATION: CHALLENGES AND SOLUTIONS FOR RENEWABLE ENERGY

The integration of renewable energy sources into existing power grids has become a critical focus as the world transitions to a sustainable energy future. Solar and wind power are expanding rapidly, but their variability and unique technical requirements pose significant challenges. This course, "Grid Integration of Renewable Energy: Challenges and Best Practices," is tailored to provide participants with the knowledge and tools to address these pressing issues effectively.



The program explores key aspects of grid integration, including managing low system inertia, ensuring stability under high renewable penetration, and employing advanced forecasting techniques to handle power fluctuations. Participants will learn about stochastic optimization, conditional risk assessment, and innovative inertia monitoring methods, while gaining a practical understanding of inverter technologies and adherence to grid codes.

Led by industry experts, this course offers a blend of theoretical insights and practical applications through real-world case studies, interactive discussions, and hands-on examples. Special emphasis is placed on resilience planning, including strategies to prevent blackouts and improve grid reliability in systems with 100% inverter-based resources.

PVSYST
PHOTOVOLTAIC SOFTWARE

By the end, learners will be equipped to tackle grid integration challenges and contribute to developing efficient, reliable, and sustainable power systems in the evolving energy landscape.

TOPICS

1. PV Plant Design and Specifications

- *Sizing of PV plants using PV Syst:*
  - *Grid-connected systems*
  - *Stand-alone systems*
- *Energy Storage Solutions*
- *Inverter Types and Selection*
- *Cable Sizing and Loss Calculations*
- *Preparing the Bill of Quantities (BoQ)*
- *Writing Technical Specifications*

2. Challenges & Solutions of Renewable Energy Integration

- ***Low Inertia and Its Impact:***

1. *Declining System Inertia: Challenges and Solutions*
2. *Frequency and Role of Inertia:*
   - *Concept of Critical Inertia*
   - *Inertia Monitoring and Forecasting Methods*
   - *Improving Frequency Response in Low-Inertia Systems*
   - *Dynamic Frequency Containment Reserve Requirements*

- **Stability Issues in Renewable Grids:**

1. Stability Classifications:
   - Converter-Driven Stability
   - Resonance Stability
   - Stability in 100% Inverter-Based Resources (IBRs)

- **Reliability and Resilience Challenges:**

1. Resilience Planning:
   - Insights from Major Global Blackouts
   - Definitions: High Impact Low Probability (HILP) and Low Impact High Probability (LIHP) Events
   - Value at Risk (VaR) and Conditional Value at Risk (CVaR) Applications

3. Managing Power Fluctuations in Large-Scale PV Plants

- *Deterministic Models*
- *Stochastic Models*
- *Probabilistic Models and Risk Assessment*
- *Renewable Power Forecasting Techniques*

4. Generator Planning with Renewable Energy

- *Stochastic Optimization Techniques*
- *Inertia Modelling for Renewables*
- *Conditional Value at Risk (CVaR) Applications*

5. Wind Power Integration

- *Overview of Wind Power Technology*
- *Network Integration of Wind Power*
- *Wind Power Forecasting Techniques*
- *Grid Codes and Compliance Beyond Standards*

6. Inverter Technology

- *Grid-Forming Inverters vs. Grid-Following Inverters*

Capstone Module: Practical Case Studies and Applications

- *Real-World Grid Integration Scenarios*
- *Addressing Power Fluctuations with Forecasting and Optimization*
- *Strategies for Enhancing Grid Reliability and Efficiency*

Tools

o All Classes are Live via Google Meet or Zoom
o MS PowerPoint slides
o Calculation on MS Excel
o PDF material

Benefits of the program

1. *Join the professional training*
2. *Understand the real world*
3. *Be a part of the Professional Engineers' Community*
4. ***Program Completion Certificates***
5. ***Join our engineers' WhatsApp Groups***
6. ***Session Recordings***

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