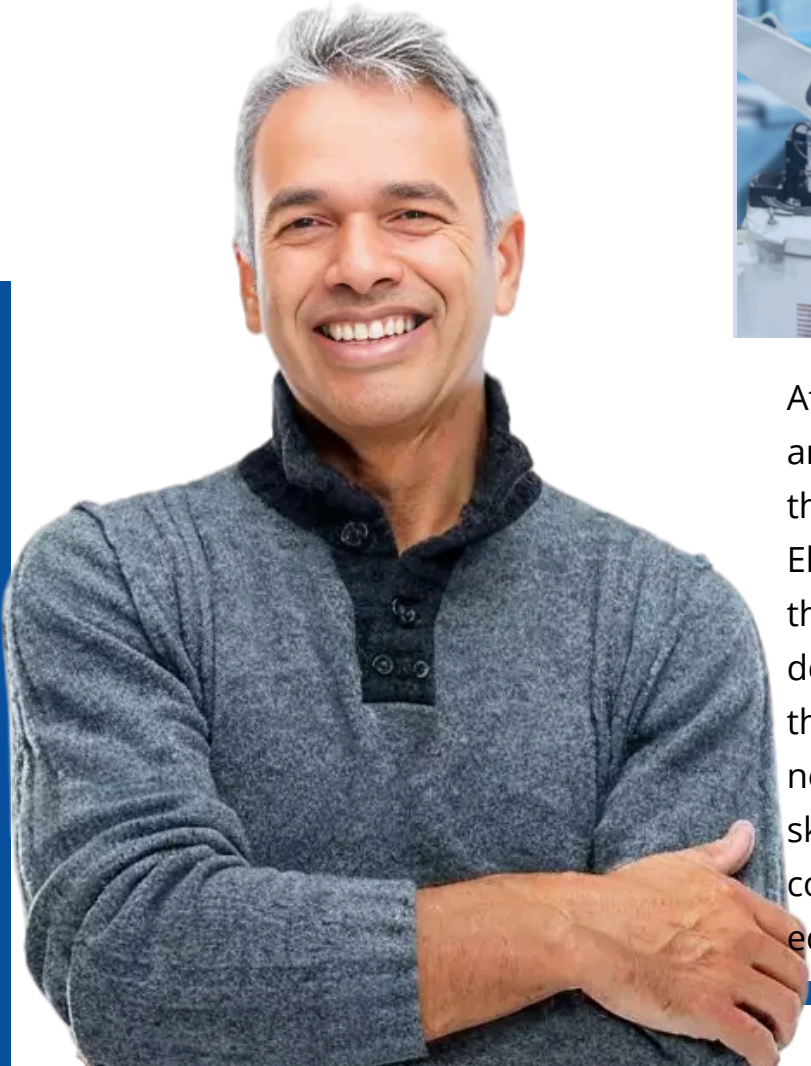




ENGINEERS' CERTIFICATION PROGRAM

Engineering Skills



Power Protection & Substation Automation



ELP

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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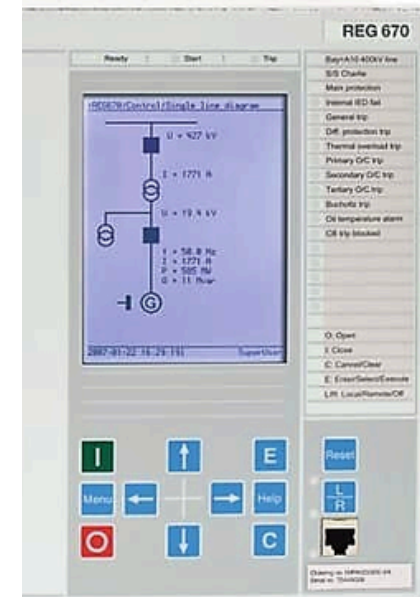
🌐 <https://electricallearningportal.com>

POWER SYSTEM PROTECTION & SUBSTATION AUTOMATION

Welcome to the "Power System Protection and Substation Automation" training program, hosted by the Electrical Learning Portal (ELP). This comprehensive course is designed to provide a thorough understanding of power system protection and the intricacies of substation automation. Participants will start with the basics, exploring the elements of power systems, including generation, transmission, and distribution, and addressing future challenges in the power sector.

The training will cover essential aspects of substation equipment and sensors, including various types of substations, busbar arrangements, and critical components like circuit breakers, transformers, and control rooms. We will delve into HVDC systems, highlighting the need for HVDC, its types, and its future. The course will also focus on power system protection, including overcurrent protection, transformer protection, feeder/line protection, and generator and motor protection, emphasizing traditional and modern protective technologies.

In the final segments, participants will explore substation automation, digital substations, and communication protocols such as IEC 103 and IEC 61850. The training will cover the architecture and challenges of automation networks and provide hands-on sessions with ABB, Siemens, and Schneider/GE IED configurations. This program offers an immersive experience to enhance your expertise in power system protection and substation automation, preparing you for the evolving demands of the power sector.



TOPICS

1. Introduction to the Power System

- *Elements of Power System.*
- *Generation*
- *Transmission*
- *Distribution*
- *Future Challenges.*

2. Substations Equipment and Sensors

- *Types of substations.*
- *Busbar arrangements.*
- *Circuit Breakers.*
- *Disconnectors and Earth Switches.*
- *Current Transformers.*
- *Voltage Transformers.*
- *Transformers.*
- *Generators.*
- *Local Control Room.*
- *Remote Control Centre.*
- *LV/MV Switchgears.*
- *Auxiliary Supplies.*

3. HVDC System/Renewable Energy System

- *Challenges posed by Renewable Energy*
- *Constraints of AC Power System*
- *Need of HVDC*
- *Types of HVDC Systems*
- *Future of HVDC*

4. Basics of Power System Protection

- *Need for Power System Protection*
- *Basic Components of Protection System*
- *Various Protective devices old and new*
- *Various philosophy of protection system*
- *Future of Protection System in Power Sector*

5. Overcurrent Protection and coordination

- *Need for Power System Protection*
- *Basic Components of Protection System*
- *Various Protective devices old and new*
- *Various philosophy of protection system*
- *Future of Protection System in Power Sector*

5. Overcurrent Protection and coordination

- *Basics of Overcurrent Protections.*
- *Various Principles on which Over current Protections work.*
- *Different Applications of Overcurrent Protections.*
- *Directional Feature.*
- *Coordination of Overcurrent Relays in any Network.*
- *Hands-on Tutorials.*

6. Transformer Protections

- *Transformer Unit Protection*
- *Transformer Backup Protections*
- *Transformer Tank/Mechanical Protections*
- *Transformer Fire Fighting System*
- *Transformer Pre/Post Commissioning Test at Site*

7. Feeder/Line Protections

- *Types of Feeders/Lines.*
- *Unit Protection.*
- *Backup Protection.*
- *Broken Wire Protection.*
- *Auto reclose*
- *Fault Locator*

8. Generator protections

- *Generator Unit Protection.*
- *Backup Protections.*
- *Stator Protection.*
- *Rotor Protection.*
- *Mechanical Protections.*
- *Overall Protections*

9. Motor Protections

- *Motor Unit Protections*
- *Motor backup*
- *Thermal Protection*
- *Locked Rotor*

10. Filter/Capacitor Protections

- *Filter Unit Protection*
- *Backup*
- *Capacitor Unbalance Protection*
- *Voltage Protections*
- *Resistor/Reactor Protections*
- *Discharge Protections*

11. Supervision & Other Components of Protection System

- *CT Supervision*
- *VT Supervision*
- *IRF (Watchdog)*
- *Interlockings*
- *Tripping System & Trip Circuit Supervision.*
- *AC/DC Fail.*
- *Circuit Breaker Fail*
- *Panel Protection*

12. IEC 103, IEC 61850 Basics and Substation Automation

- *Basics of Substation Level Communication & Automation*
- *Different Types of Protocols*
- *IEC 103 Protocol Basics*
- *IEC 61850 Protocol*
- *MMS, GOOSE, Dataset*
- *Time Synchronization*

13. Digital Substations

- *Concept of Digital Substations*
- *Non-Conventional CT/VT*
- *Merging Units*
- *Process Bus*
- *Station Bus*
- *Future of Substation Automation*

14. Substation Automations Typical Network Architecture

- *Basic Elements of Automation Network*
- *Various Types of Architectures*
- *Challenges*
- *Solution to those Challenges*

15. Basic concepts of numerical relays

- *Basic Elements of Numerical Relays*
- *BCU/BCPU/Protective Relays*
- *Aux Power Supply*
- *Binary Input*
- *Binary Output*
- *Analogue Input*
- *Configuration Tool & Basics*
- *Fault Recorder/ Event Recorder*
- *Communication Protocol*

16. ABB Make IED's Configurations. (PCM600)

17. Siemens Make IED's Configurations (Digsy 4.XX)

18. Schneider/GE Make IED's Configurations (Studio/Agile/Easergy Pro)

19. Hands on Sessions 5 (Chance to do Offline Configuration of IED's)

Software Used:

- **PCM 600**
- **Agile(GE)**
- **Digsy**
- **IED Scout**
- **Megger RTMS**
- **Omicron quick CMC**

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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SIEMENS

