Advanced Electrical Power System Analysis and Design Course

7 – 11 March 2027
Cape town

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Ref: 974_174251 **Date:** 7 – 11 March 2027 **Location:** Cape town **Fees:** 6000 Euro

Overview

Advanced Electrical Power System Analysis and Design Course is a one-week course for engineers and technical project professionals who need a Power System Design Study Pack. Participants connect power system analysis, network modelling, load flow analysis, short circuit analysis, voltage performance, equipment rating, and reliability evidence to documented design decisions. The course resolves gaps between model assumptions and equipment selections through traceable study cases, acceptance checks, and review records. Agile Leaders Training Center delivers this power system design course.

Who Should Attend

- Teams responsible for modelling utility, industrial, and infrastructure electrical networks
- Functions responsible for load forecasts, voltage studies, and reactive-power decisions
- Personnel responsible for fault studies, equipment duty, and protection interfaces
- Engineering groups responsible for design reviews, expansions, and technical assurance
- Project teams responsible for converting study findings into design actions

The course assumes participants interpret single-line diagrams, equipment data, and engineering calculations at work, while it leaves out basic circuit theory and vendor-specific software operation.

Departments and Industries

The course applies power-system studies across organizations that design, operate, expand, or assure electrical networks.

- Power-system planning and engineering in utilities and independent generation
- Electrical design and project delivery in industrial plants and process facilities
- Asset management and technical assurance in transport and infrastructure
- Operations engineering in data centers and large commercial facilities
- Consulting, contracting, and owner-engineering functions

Learning Objectives

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

- Build traceable network models from equipment and operating data
- Analyze load flow, voltage, loading, and reactive-power results
- Apply short-circuit methods and evaluate equipment duty
- Compare contingencies, operating configurations, and reliability responses
- Evaluate study assumptions, acceptance criteria, and design margins
- Prioritize design actions through an auditable study package

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Course Agenda

Day 1: Network Model and Study Basis

- Single-Line Diagram Boundary and Study-Scope Method
- Per-Unit Network Model and Base-Quantity Framework
- Source, Transformer, Line, Cable, and Load Data Register
- Operating Configuration and Scenario Definition Matrix
- Model Validation and Data-Quality Checklist

Day 2: Load Flow and Voltage Design

- Load Flow Analysis Case Set and Convergence Checks
- Bus Voltage Profile and Equipment Loading Dashboard
- Reactive-Power Balance and Power-Factor Evaluation Method
- Transformer Tap and Voltage-Control Option Matrix
- Loss, Capacity, and Design-Margin Decision Record

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Day 3: Fault Level and Equipment Duty

- IEC 60909 Short-Circuit Calculation Study Basis
- Balanced and Unbalanced Fault Scenario Set
- Breaker Interrupting and Making-Duty Evaluation Sheet
- Busbar, Cable, and Transformer Thermal-Duty Check
- Fault-Level Mitigation Option Comparison Matrix

Day 4: Contingency, Protection Interface and Reliability

- Normal and N-1 Contingency Screening Method
- Protection Coordination Interface Data Map
- Critical Load Supply and Transfer-Scheme Evaluation
- Reliability Risk Register and Failure-Consequence Ranking
- Study Findings, Exceptions, and Design-Action Log

Day 5: Design Review Practice and Capstone

- Exercise on Network Model Audit and Scenario Selection
- Exercise on Voltage Profile and Reactive-Power Decisions
- Exercise on Fault Duty and Equipment Rating Decisions
- Exercise on Contingency Findings and Reliability Actions
- Capstone Exercise: Power System Design Study Pack

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Practical Exercises

The course uses suggested activities that turn study inputs and results into traceable engineering decisions.

- Suggested activity: audit a network model against a single-line diagram and equipment-data register
- Suggested activity: compare load flow cases and select voltage-control and capacity actions
- Suggested activity: test fault duties against equipment ratings and record mitigation options
- Suggested activity: present a design review pack linking assumptions, exceptions, risks, and actions

FAQs

Who suits advanced electrical power system analysis and design, and what does it assume?

Engineers who already interpret single-line diagrams, equipment data, and calculation outputs suit the course. It assumes working knowledge of three-phase systems and leaves basic circuit theory and vendor-specific software instruction outside scope.

How does power system analysis and design differ from basic electrical design training?

Power system analysis and design evaluates network behavior under defined operating and fault cases. Basic electrical design training usually emphasizes layouts, circuits, cable selection, and installation requirements without the same depth of system-wide modelling and scenario evidence.

Why is load flow analysis required before equipment and voltage decisions?

Load flow analysis reveals bus voltages, branch loading, losses, and reactive-power balance for each operating case. Those results support transformer taps, compensation, equipment capacity, and network reinforcement decisions.

How does short circuit analysis support equipment rating decisions?

Short circuit analysis estimates fault-current duties at defined locations and times. Engineers compare those duties with breaker, busbar, cable, transformer, and grounding capabilities to identify unacceptable exposure and mitigation needs.

What makes a power system design study auditable?

An auditable study records source data, assumptions, model versions, operating cases, calculation methods, acceptance criteria, exceptions, findings, and assigned actions. A reviewer can then trace each recommendation to the evidence that supports it.

Conclusion

Participants take back a Power System Design Study Pack containing model inputs, study cases, result checks, equipment-duty evaluations, risks, and design actions. The pack changes disconnected calculations into a traceable engineering decision record. Teams can update it as project data develops and use it during design assurance and approval reviews.