TRAINING TITLE
POWER SYSTEM ANALYSIS

Training Duration
5 days

Training Venue and Dates

Ref. No. EE095	**Power System Analysis**	**5**	**24-28 Feb. 2025**	**$5,500**	**Dubai, UAE**

In any of the 4 or 5-star hotels. The exact venue will be informed later.

Training Fees
- **$5,500 per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Lunch**

Training Certificate
Define Management Consultants Certificate of course completion will be issued to all attendees.

TRAINING DESCRIPTION
The **Power System Analysis Training** is designed to provide participants with a comprehensive understanding of the operation, analysis, and optimization of electrical power systems. This training is ideal for engineers, technicians, and professionals involved in the design, operation, maintenance, and optimization of electrical power systems. It covers the essential concepts, methodologies, and tools used to analyze power systems, ensuring stability, efficiency, and reliability in the generation, transmission, and distribution of electrical energy.

TRAINING OBJECTIVES
By end of course participants will be able to understand

- Understand the basic definitions and concepts associated with short circuit, power flow and stability analysis.
- Discuss in detail techniques and tools for power system analysis, with a practical perspective.
- Understand the principles for regular power flow and optimal power flow methods.
  Understand the main principles for modelling and analysis of power systems subject to symmetrical and unsymmetrical faults.
  Understand the mathematical formulation and use of symmetrical components.

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- Understand modelling of transformers, lines and cables in the positive, negative and zero sequences based on physical models.
  Understand the impact of different earthing principles.
  Understand the basic principles for power system protection.
- Use of the load flow study to access power system performance and voltage profiles.

WHO SHOULD ATTEND?

- Professional electrical engineers
- Project Engineers involved in the analysis , engineering and design of industrial and commercial power systems

TRAINING METHODOLOGY

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions and motivating everybody to find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.
Very useful Course Materials will be given.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work& Practical Exercises
- 20% Videos& General Discussions

COURSE PROGRAM

Fundamentals

- **Steady state AC circuit analysis**
- **Three phase systems**
- **Symmetrical components**

Power System Element Modeling

- **Transmission lines**
- **Electromagnetic analysis**
- **Line parameters**
- **Equivalent circuits**

Power transformers

- **Three phase transformer**
- **Regulating transformers**

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- Per unit system
- Equivalent circuits
- Synchronous machine control models

Power flow analysis

- Formulation
- Solution methods
- Computer analysis of power flow

Power Flow Applications

- Power transfer capability
- Transmission losses
- Voltage stability

Steady State Controls

- Generator controls
- Capacitor/reactor switching Transformer controls

Economic Operation of Power Systems

- Economic characteristics
- Economic dispatch
- Operation in a deregulated environment

Power System Control

- Load-frequency control
- Voltage control
- Integration of economic operation

Short Circuit Analysis

- Per Unit Quantities
- Three Phase Short Circuits
- Reactance Diagrams and Percentage Values
- Short Circuit KVA
- Analysis of R-L Circuit
- Three Phase Short Circuit on Unloaded Synchronous Generator
- Effect of Load Current or Pre-fault Current
- Construction of Reactors and Classification of Reactors

Unbalanced Fault Analysis

- The Operator "'a'"
- Symmetrical Components of Unsymmetrical Phases

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- Power in Sequence Components
- Balanced Star Connected Load
- Transmission Lines
- Sequence Impedances of Transformer
- Sequence Reactance of Synchronous Machine
- Positive, Negative and Zero Sequence Network
- Unsymmetrical Faults
- Unsymmetrical Faults on an Unloaded Generator

Power System Stability

- Elementary Concepts
- Illustration of Steady State Stability Concept
- Methods for Improcessing Steady State Stability Limit
- Synchronizing Power Coefficient
- Transient Stability
- Stability of a Single Machine Connected to lnfinite Bus
- The Swing Equation
- Equal Area Criterion and Swing Equation
- Transient Stability Limit
- Frequency of Oscillations
- Critical Clearing Time and Critical Clearing Angle
- Transient Stability When Power is Transmitted During the Fault
- Fault Clearance and Re-closure in Double-Circuit System
- Solution to Swing Equation Step-by-Step Method
- Factors Affecting Transient Stability
- Dynamic Stability
- Node Elimination Methods

Voltage Stability and Control

- Definitions and basic concepts.
- Tools: Eigen value analysis.
- Control and protection: PSSS; FACTS.
- Practical applications: A real blackout analysis

Transient and frequency Stability and Control

- Definitions and basic concepts.
- Tools: time domain simulations; direct methods (energy functions and equal area criterion).

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- **Practical applications: A real blackout analysis.**

Harmonic analysis studies

- **Causes of power line distortion**
- **Measuring power line distortion**
- **Harmonic distortion limits**
- **Effects of power line distortion**
- **Placement of harmonic filters**

Earthing systems

- **Introduction**
- **Different earthing systems**
- **Influence of the earthing system**
- **Earth electrode and earth resistance**
- **Earthing system and fault current**

NOTE:
Pre-& Post Tests will be conducted.
Case Studies, Group Exercises, Group Discussions, Last Day reviews, and assessments will be carried out.

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