



## Power System Analysis and Calculations In Electrical Networks Using ETAP Power Station Training

### Description

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Power system equipment must withstand not only the rated voltage, which corresponds to the highest voltage of a particular system, but also expected short level. Accordingly, it is necessary to set protective relays based on these results obtained from short circuit study. One of hot issues now related to these is arc flashing study which is mainly based on the studies of short circuit and relay co-ordination as well. All these three issues should be dealt as integral parts & bulk.

Power System Analysis means verifying the adequacy of the power distribution system and its components recognize coordination related disturbances and outages and collecting the required data to perform a detailed required study.

The continuity and quality of electricity delivered safely and economically by today's and future electrical power networks are important for both developed and developing economies. The correct modeling of power system equipment and correct fault analysis of electrical networks are pre-requisite to ensuring safety and they play a critical role in the identification of economic network investments. Environmental and economic factors require engineers to maximize the use of existing assets which in turn require accurate modeling and analysis techniques

#### Course Objective

**On successful completion of this course, participants will be able to:**

- Exploring the powerful capabilities of ETAP Power Station from OTI.
- Understand importance of power system modeling
- Understand the need for calculation the short circuit current.
- Manual calculation of short circuit using simple methods like MVA method, P.U. system, etc...
- Balanced & unbalanced power flow analysis.
- Voltage drops & Cable sizing.
- Transformer MVA Sizing.

- Analyze the motor starting/acceleration either static or dynamic.
- Switchgear rating (breaking & making capacities).
- Importance of arc flashing and relay co-ordination studies from operation & safety point of view.
- Design of S/S grid Earthing using ETAP.
- Test cases simulation using computer software's (ETAP 7.00)

## Course Outline

- Overview of ETAP Capabilities & Limitations.
- One-Line Diagram/One line View (OLV).
- Creating & Merging different revisions, presentations & configuration
- Scenario, Study & Project Wizards.
- Crystal Reports & Customizations.
- AC & DC Element Descriptions.
- Load modeling.
- Add, updating and remove from ETAP library.
- Electrical systems modeling and fundamentals.
- Load flow (balanced & unbalanced) analysis.
- Load Flow & Cable sizing.
- Transformer sizing.
- Benefits of calculated short circuit currents.
- Introduction to Fault current Calculations in brief.
- Breaking & making currents.
- Per unit systems.
- Different typical values of positive, negative & zero phase sequence impedances for unbalance faults.
- Manual Calculations of Isc by MVA Method.
- Calculation of Isc by Impedance method.
- Calculation of Isc by symmetrical components.
- Calculations as defined & recommended by IEC/ANSI standards.
- Short Circuit Studies (Fault-Levels – Switchgear/Fuse Rating). Typical cases for switchgear sizing.
- Relay co-ordination & Arc Flashing studies.
- Coordination Fundamentals
- Procedures
- Data Collection
- Plotting Time/Current Curves
- Relay Coordination Intervals
- Equipments damage curves for cables, transformers, etc...
- System Modeling for Device Coordination Study
- ETAP Star (Device Co-ordination/selectivity).
- System earthing (Solid, resistance & reactance or even ungrounded systems)
- Substation grounding grid design & Calculations.
- Motor Parameter Estimation.
- Motor Acceleration Analysis (Dynamic & Static).
- Different test simulation cases using ETAP power station version 7.00.