



POWERFACTORY

Course Content

Digsilent Buyisa (Pty) Ltd

POWER SYSTEM SOLUTIONS
MADE IN GERMANY

Electro-Magnetic Transients (EMT)

3 Day Course

Objective:

The objective of the course is to provide users of PowerFactory with the relevant knowledge to effectively utilise the EMT function.

Users will be taught how to perform time domain simulations of electromagnetic phenomena

Pre-requisites:

- **MUST have attended the PowerFactory Basic course**
- A good working knowledge of the basic techniques used in PowerFactory.

No of participants:

In-house at Customer premises: Minimum: 6; Maximum: 12.

At Digsilent Buyisa Training Centre: Minimum: 6; Maximum 16.

Online: Minimum 6; Maximum x16.

ECSCA CPD Accredited and Points:

- The course is fully accredited with the Engineering Council of South Africa (ECSCA).
- 3 CPD point for completion.

Who Should Attend:

The course is intended for

- Utility engineers
- Power system operators
- Project Developers
- Manufacturers
- Consultants and electrical engineers



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PRICE PER PARTICIPANT:

- For course pricing, kindly visit our website at: <https://digsilent.co.za/training-courses/>
 - For in house prices @ customer premises: contact Digsilent for a quote via email info@digsilent.co.za or Telephonically (+27) 087 351 6159.
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- ❖ Prices are exclusive of VAT
 - ❖ Please note that cost excludes your Company's internal administrative costs.
 - ❖ All prices may change without prior notice - please contact Digsilent Buyisa for the latest prices before booking.
 - ❖ **DISCOUNT** is offered if a company sends more than one delegate per course.
 - ❖ Trainings held at Digsilent Buyisa Training Centre includes light breakfast snack, lunch and refreshments.

Training schedule

DAY 1

08:30 Power System Transients

Introduction to the Time domain simulation of electromagnetic (EMT) and electromechanical (RMS) transients. Application fields for EMT and RMS simulations, Models. Calculation of initial conditions for EMT simulations and modelling aspects.

Transformer Energisation

Simulation of power transformers energisation and analysis of results. Focusing on transformer inrush currents, saturation characteristic, harmonic content of inrush currents, RMS voltage drop, residual flux and breaker closing times.

10:30 Tea/Coffee break

11:00 Exercise 1: Transformer Energisation

Investigate the energisation of a 60 MVA 132/10.6 kVA YNd5 transformer

12:30 Lunch Break

13:30 Capacitor Switching

Simulating energisation of capacitor banks. Mainly focusing on Inrush currents, transient switching overvoltage, grid reactance determination, back-to-back capacitor bank energisation and oscillation frequencies.

15:00 Tea/Coffee break

15:30 Exercise 2: Capacitor Switching

Introduction to capacitor bank switching transients.

16:30 End of the first day

DAY 2

- 08:30 Transient Recovery Voltage (TRV) Analysis**
Simulation of switching of inductive currents and analysis of transient recovery voltage (TRV). Mainly focusing on switching of shunt reactor, TRV and RRRV analysis, circuit breaker capability curves, influence of current chopping, mitigation with R-C suppressor and switching of fault currents.
- 10:30 Tea/Coffee break**
- 11:00 Exercise 3: TRV Analysis of Shunt Reactor Switching**
Analysis of TRV at fault interruption and load switching
- 12:30 Lunch break**
- 13:30 Overhead line and Cable Models for EMT Simulations**
Modelling of overhead line and cable system for EMT simulations. With focus on geometric overhead lines, detailed cable systems, distributed parameter line models, frequency for travel time simulation and travelling wave effects.
- 15:00 Tea/Coffee break**
- 15:30 Exercise 4: Overhead Line and Cable Systems**
Modelling a 400 kV double circuit overhead line and cable system.
- 16:30 End of the second day**

DAY 3

08:30 Line Switching

Analysis of transient overvoltages during energisation of overhead transmission lines and cable systems. Focusing on energisation of overhead lines and cable systems, missing zero-crossing phenomena, re-energisation of overhead line with trapped charge, surge arrester modelling, stochastic switching/ multi-run EMT simulation and pre-insertion resistor.

10:30 Tea/Coffee break

11:00 Exercise 5: Line Switching

Analysis of switching transients associated with overhead lines and cables.

12:30 Lunch break

13:30 Lightning Transients

Analysis of lightning transient overvoltages. Focusing on modelling detailed overhead lines, ground wire strike, back flashover, overhead line performance, direct lightning strike, substation overvoltages and surge arrestors.

15:00 Tea/Coffee break

15:30 Exercise 6: Lightning Overvoltages

Analysing the lightning performance of a 110 kV overhead transmission line and investigating the lightning overvoltages at a nearby 110/33 kV substation.

16:30 End of the third day