



POWERFACTORY

Course Content

Digsilent Buyisa (Pty) Ltd

POWER SYSTEM SOLUTIONS
MADE IN GERMANY

Dynamic Analysis of Renewable Energy Generation

2 Day Course

Objective:

The two-day training "Dynamic Controller Modelling" complements the DigSILENT "Power System Stability" training course. The whole procedure of translating a physical system into a set of mathematical equations and implementing it using the PowerFactory simulation language DSL (DigSILENT Simulation Language) will be introduced and practiced.

Various aspects of the DSL language, like the description of differential equations, issuing simulation events, coding dead-times etc. will be introduced systematically and each participant will practice extensively the implementation process of various DSL models.

Pre-requisites:

- **MUST have attended the PowerFactory Basic course.**
- A good working knowledge of the basic techniques used in PowerFactory.
- Each participant should have basic knowledge about the PowerFactory software, being familiar with the PowerFactory time domain simulation functions ("RMS-simulation" or "EMT-simulation") is also required for successfully participating in this workshop.

No of participants:

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

At Digsilent Buyisa Training Centre: Minimum: 10; Maximum 16.

Online: Minimum 6; Maximum 16.

ECSCA CPD Accredited and Points:

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

Who Should Attend:

The course is intended for

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



POWERFACTORY

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 training@digsilent.co.za or Telephonically (+27) 087 351 6159.
-
- ❖ 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 | Dynamic Modelling Approach in PowerFactory
Fundamentals. Dynamic modelling in practice. |
| 09:00 | Exercise: Dynamic Modelling Approach
Identify and familiarise with dynamic controls and connection patterns associated to grid elements |
| 10:00 | Dynamic Modelling Handling
Model type/elements handling. Identification of Common model and Composite model |
| 10:15 | Exercise: Include Dynamic Models in a Network
Definition of dynamic models from standard model definitions and composite models |
| 10:30 | Tea/Coffee break |
| 11:00 | Dynamic Modelling Concepts
Interpret and visualise a functional block diagram. Identify the transfer function in a block diagram. |
| 11:30 | Exercise: Interpret a block diagram |
| 11:45 | Introduction to DSL and Graphical Modelling
Implementation of models via graphical interface. General considerations of DSL |
| 12:30 | Lunch break |
| 13:30 | Exercise: Model Definition of a Voltage Controller
Usage of the standard macros to build a block diagram to represent an excitation system. Definition of a frame diagram. |
| 14:00 | Exercise: Dynamic Model Initialisation
Initialisation concept and procedure. Dynamic model definition: common and composite model. |



POWERFACTORY

- | | |
|--------------|--|
| 14:30 | Exercise: Initialisation of the Voltage Controller Model
Definition of the initial conditions for the excitation system |
| 15:00 | Tea/Coffee break |
| 15:30 | Composite Frame Implementation
Definition of composite frame. Identification of signal names in a composite frame. |
| 15:45 | Exercise: Implementation of the Voltage Controller Model and Test
Define the composite model and test the voltage controller |
| 16:15 | Dynamic Model Templates
Packing and re-using models/ Template Definition. |
| 16:30 | Exercise: Define and use a Generator Set Template
Define a template for a generator set and applying it. |
| 17:00 | End of the first day |

DAY 2

- | | |
|--------------|---|
| 08:30 | DSL Syntax and Transfer Function Macro
DSL syntax and coding. DSL standard and special functions. Write transfer function using DSL code. |
| 9:30 | Exercise: Complete a Plant Control Model
Create a macro and familiarise with DSL coding. |
| 10:30 | Tea/Coffee break |
| 11:00 | Exercise: Complete a Plant Control Model
Use graphical interface and DSL coding. Implement a complete controller for a synchronous generator. |
| 12:30 | Lunch break |
| 13:30 | Continuation Exercise: Complete Plant Control Model
Find the initial conditions for the different models and test. |



POWERFACTORY

15:00 **Coffee break**

15:30 **Dynamic Modelling Auxiliary Elements and DSL Features**

Usage of station measurement elements. DSL event function. Special frame features

16:00 **Exercise : Simple Undervoltage Relay**

Implement an undervoltage load-shedding relay using DSL and test it. Usage of the special event function.

Optional exercises:

Modelling, initialisation and test of the following models:

- Dynamic Load Model
- Switched Shunts
- Simple PV Plant Model
- Fixed Speed Induction Generator (FSIG) Model

17:00 **End of the Training Course**