

## INFORMATION

Please complete and sign registration and return either via fax +49 7072 916 888 or a scanned copy via electronic mail to: c.koenig@digsilent.de. Upon submission of your registration you will receive an acknowledgement of receipt and invoice. Final confirmation will be established after receipt of payment.

**Without this confirmation your registration is not valid. By our written confirmation your registration becomes legally binding.**

### CANCELLATIONS

Up to 8 weeks before the course: at no cost  
Up to 2 weeks before the course: 50% of the course fee  
Less than 2 weeks before the course: 100% of the course fee

DigSILENT reserves the right to cancel a course due to insufficient participants up to 4 weeks before the beginning of the course. In the event that an already confirmed course needs to be cancelled due to force majeure, participants will be informed as soon as possible and course fees already paid will be reimbursed. Further claims such as travel expenses or hotel cancellation fees are excluded from this practice if the cancellation of the course is not due to grossly negligent behaviour by DigSILENT GmbH.

**Detailed information about how to get to DigSILENT will be sent along with the confirmation.**

### LUNCHES

Lunches are included in the course fees. Please indicate whether you would prefer vegetarian or non-vegetarian.

### TRAINING MATERIAL

Our training material is protected by copyright. Duplication or transfer is prohibited and requires the written consent of DigSILENT GmbH.

### ACCOMMODATION

We recommend booking your accommodation in one of the hotels listed below:

- Hotel Alznauer Hof, Raiffeisenstr. 2, 72810 Gomaringen
- Hotel Arcis, Bahnhofstr. 10, 72810 Gomaringen
- Hotel Nehrener Hof, Bahnhofstr. 57, 72147 Nehren
- Hotel Domizil, Wöhrdstr. 5-9, 72072 Tübingen

### COURSE FEES:

For DigSILENT Users with valid guarantee or maintenance period reduced course fees apply. Included in the course fees are training material, coffee breaks and lunches.

## REGISTRATION

Company: \_\_\_\_\_

Department: \_\_\_\_\_

VAT No.: \_\_\_\_\_  
(European Community)

First name: \_\_\_\_\_

Last name: \_\_\_\_\_

Street: \_\_\_\_\_

Zip Code: \_\_\_\_\_

City: \_\_\_\_\_

Country: \_\_\_\_\_

E-Mail address: \_\_\_\_\_

Participant's name: \_\_\_\_\_

Invoicing address: \_\_\_\_\_  
(if different)

Signature: \_\_\_\_\_

For how long have you been using PowerFactory regularly?

New user    > 1 year    > 2 years    > 5 years

**LUNCH**                                  non-vegetarian                  vegetarian  
(please select an option)

By submitting the form you agree to the storage and use of your data to process your inquiry at DigSILENT GmbH.

### PRICE PER PARTICIPANT

Euro **1,118.00 plus VAT** (with valid maintenance agreement)  
Euro **1,270.00 plus VAT** (without valid maintenance agreement)  
Euro **381.00 plus VAT** (with valid student ID)

**DigSILENT TRAINING**

DIG  
SILENT

# Dynamic Modelling Workshop (DSL)

S2019.1114.GO



**14 - 15 November 2019**

Training facilities at DigSILENT GmbH in Gomaringen

## INTRODUCTION

The two-day workshop Dynamic Modelling complements the DigSILENT course Power System Stability, giving an overview of the modelling process in DigSILENT using the PowerFactory simulation language DSL (DigSILENT Simulation Language). The whole procedure of translating a physical system into a set of mathematical equations and implementing it using DSL will be introduced and practised by the participant. The workshop introduces various aspects of the DSL language, including the description of differential equations, issuing simulation events and coding dead-times, giving the participant the opportunity to practice with a wide range of different types of proposed exercises different aspects of DSL modelling. A procedure and guide to establish initial conditions will be exposed and practised.

### WHO SHOULD ATTEND

The course is intended for utility engineers, power system operators, project developers, manufacturers, consultants and electrical engineers in general, interested in the modelling of control processes within the power systems. Participants should be familiar with the basic handling of DigSILENT PowerFactory. Experience with PowerFactory's time domain simulation functions is required.

## PROGRAMME

### DAY 1

09:00h	<b>Introduction to DSL (DigSILENT Simulation Language)</b> Fundamentals. Basics about Laplace transformation: transformation from time domain to frequency domain equations and viceversa.
09:30h	<b>Writing DSL macros</b> Definition of variables and general syntax. DSL special functions. Definition of simulation events from DSL models. Macro concept.
10:00h	<b>Exercise: Create a macro using DSL</b> Definition of a user defined macro writing DSL equations.
10:30h	<b>Coffee break</b>

11:00h	<b>DSL Model via Graphical Interface</b> DSL model via graphical interface. Overview of standard macros. Composite frame diagram.
12:00h	<b>Exercise: Simple Excitation System</b> Usage of the standard macros to build a complete block diagram to represent an excitation system. Definition of a frame diagram.
12:30h	<b>Lunch Break</b>
13:30h	<b>Calculation of initial conditions and dynamic models</b> Initialisation concept and procedure. Dynamic model definition: common and composite model, modelling approach.
14:15h	<b>Exercise: Definition of initial conditions</b> Definition of the initial conditions for the excitation system. Definition of the dynamic model and test.
15:00h	<b>Coffee break</b>
15:30h	<b>Exercise: Hydro Turbine and Governor</b> Modelling of a hydro turbine and governor using standard and user defined macros. Definition of initial conditions and adaptation of the dynamic model.
17:00h	<b>End of the first day</b>

### DAY 2

09:00h	<b>DSL Special features</b> Station measurement elements. Discrete time function basics. Measurement files. Signal random variation.
09:45h	<b>Exercise: Dynamic Load Model</b> Dynamic model definition to control active and reactive power for a load. Modelling, initialisation and test.
10:30h	<b>Coffee break</b> Assessment of switching overvoltages due to reactor drop out. Vacuum circuit breaker model. Current chopping.

11:00h	<b>Exercise: Under-voltage relay</b> Under-voltage relay model definition. Application of DSL event function. Modelling, initialisation and test.
12:30h	<b>Lunch break</b>
13:30h	<b>Exercise: Switched shunts</b> Shunt controller definition using the DSL event function. Modelling, initialisation and test.
15:00h	<b>Coffee break</b>
15:30h	<b>Optional Exercises</b> Modelling, initialisation and test of the following models: <ul style="list-style-type: none"><li>• Steam plant model including turbine and governor.</li><li>• User defined excitation system.</li><li>• STATCOM.</li><li>• Fully-rated wind turbine.</li><li>• Fixed Speed Induction Generator (FSIG).</li></ul>
17:00h	<b>End of the course</b>



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