POWERFACTORY

Dynamic Modelling with Modelica and FMI
PowerFactory 2024

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July 23rd - 24th 2024

Online Training Course via Zoom

The one-and-a-half-day training course "Dynamic Modelling with Modelica and FMI" provides an introduction to the development, integration and usage of Modelica and FMI models within a power system model using *PowerFactory*. In particular, focus is dedicated to power system components which are operating using discrete and sampled data-based digital controls. The following topics are included:

- Introduction to Modelica as modelling environment for discrete models
- Development and integration of models for digital controls
- The Functional Mock-up Interface (FMI) and usage of external models

Each topic above includes a theoretical background and a practical part where participants acquire hands-on experience in the use of *PowerFactory*.

WHO SHOULD ATTEND:

The course is intended for control and electrical engineers responsible with the development, maintenance or usage of dynamic simulation models of power system components which are designed for use within the *PowerFactory* software.

Previous experience in *PowerFactory* basics and some experience in handling of *PowerFactory*'s time domain simulation functions, or attendance of the equivalent introductory courses ("Load Flow and Short Circuit Calculation" and "Time Domain Simulation"), is essential.

PRICE PER PARTICIPANT:

- € 924.00* (with valid maintenance contract)
- € 1,087.50* (without valid maintenance contract)
- € 327.00* (with valid student identification)

*Prices are exclusive of VAT

Dynamic Modelling with Modelica and FMI

DAY 1

MODULE 1: Dynamic Modelling with Modelica - Fundamentals

Presentation: Introduction to Modelica modelling environment   **1 h**

Model Specifications/Requirements of User-Defined Models (UDM). RMS- and EMT-domain simulations.

Generic and vendor-specific UDMs. Simplified and detailed models.

Overview of the Modelica Language and the Modelica Language Specification.

Graphical and scripted modelling environment for Modelica models within *PowerFactory*.

Exercise: Hands-on experience with a simple Modelica model $^1/_2$ **h**

View, understand and parameterise a model.

Run a simulation and plot Modelica model signals.

Coffee break

Exercise: Development of a basic Modelica model   **1 $^1/_2$ h**

Create, debug and parameterise a simple controller model.

Steady state operation: setting initial conditions of the developed model.

Dynamic simulation: controller response and analysis.

Q&A session

Lunch break

MODULE 2: Development and integration of time-discrete Modelica models

Model development: workflow and tools for creation of complex UDMs $^3/_4$ **h**

High-level Control System Representation of UDMs.

Control systems: Fundamentals; time-continuous and time-discrete models.

Model structure: Type Instances/Submodels, algorithms, parameterisation, initialisation.

Model flexibility: data types, scalar/array variables, conditional components.

Exercise: Develop a controller for power electronics (PE) converter system $^3/_4$ **h**

Create, debug and parameterise a control system for a converter based generator.

Operating with array signals in Modelica models and in the Composite Model Frame.

Coffee break

Exercise (continued): Develop a controller for a PE converter system   **$1^1/_2$ h**

Steady state operation: setting initial conditions of the developed model.

Debugging/analysis of model behaviour for various operation scenarios.

Q&A session

DAY 2 (half-day)

Exercise (continued): Develop a controller for a PE converter system   **$1^1/_2$ h**

Dynamic simulation: controller response and analysis.

Creating a complete power equipment simulation model by means of a general template.

Coffee break

MODULE 3: The Functional Mock-up Interface (FMI)

FMI as a comprehensive solution for model exchange in power systems   **$^3/_4$ h**

Vendor-independent, tool-independent model interfacing for simulation of power system components.

FMI as a common standard for exchanging dynamic models between OEMs and Utility operators. Tools supporting FMI.

Functional Mock-up Units (FMUs): structure, specifications, data protection and cross-platform compliancy.

FMI Import: Integration of FMUs within *PowerFactory*.

FMI Export: Exporting *PowerFactory* Modelica models as FMUs

Exercise: Integration into *PowerFactory* of an FMU-based controller for PE converters   **$^3/_4$ h**

Set-up and configuration of the FMU (FMU Import)

Troubleshooting cases, simulation settings and compatibility requirements.

Q&A session

Time Schedule (Central European Time)

Full-Day	Time
First 90 minutes block	9:00
Coffee break	10:30
Second 90 minutes block	10:45
Q&A session	12:15
Lunch break	12:30
Third 90 minutes block	13:30
Coffee break	15:00
Fourth 90 minutes block	15:15
Q&A session	16:45
End of the training day	17:00

Half-Day	Time
First 90 minutes block	9:00
Coffee break	10:30
Second 90 minutes block	10:45
Q&A session	12:15
End of the training day	12:30