Faysal Aziz

A Comprehensive Journey Through Electrical Simulation

with Python Integration

FA-0529 · 5-day

Software Development · DevOps, Cloud & Infrastructure · Automation, RPA & Power Platform

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Introduction

Welcome to this comprehensive 5-day course, designed to provide a deep dive into two powerful electrical engineering simulation tools: PSS/E (Power System Simulator for Engineering) and PSCAD (Power System Computer Aided Design). This course will guide you through the core functionalities, modelling techniques, and integration capabilities of PSS/E and PSCAD, with a special emphasis on using Python for study automation.

Learning outcomes

By the end of this course, participants will be able to:

1. Understand the principles of operation of PSS/E, including load flow and RMS time domain simulation.
2. Work effectively with both built-in and user-written dynamic models in PSS/E.
3. Perform comprehensive equipment modelling in PSS/E, focusing on transformer sequence networks and input data specification.
4. Utilize Python for automating studies and processes in PSS/E.
5. Develop and write user models in Fortran for PSS/E.
6. Navigate and utilize the AEMO OPDMS within the PSS/E environment.
7. Grasp the basics of PSCAD, including workspace and study case management.
8. Model various equipment in PSCAD, including machines, inverters, transmission lines, transformers, and filters.
9. Conduct time-domain stability studies in PSCAD with an understanding of simulation controls and timed logic.
10. Utilize measurement elements in PSCAD for output post-processing.

11. Integrate third-party dynamic models in PSCAD.
12. Explore advanced PSCAD topics, including wide area modelling, snapshots, subsystems, and model development.
13. Understand and implement the Electric Network Interface (ENI) in PSCAD.

Prerequisites

Participants are expected to have:

1. A fundamental understanding of electrical engineering principles, especially in power systems.
2. Basic knowledge of simulation tools and their application in electrical engineering.
3. Proficiency in Python programming, as this will be a key part of the course. Familiarity with Python libraries for data analysis and visualization (like Pandas, NumPy, and Matplotlib) is desirable.
4. Some familiarity with Fortran programming, particularly for those interested in developing user models in PSS/E.
5. A working knowledge of power system dynamics and control theories.
6. Access to both PSS/E and PSCAD software for practical exercises.
7. Prior experience with any power system simulation tool would be beneficial, but not mandatory.

Training outline

1. PSS/E Principles of Operation

1. Introduction to Load Flow Analysis
2. RMS Time Domain Simulation
3. Basic Interface Navigation

2. Dynamic Models in PSS/E

1. Working with Built-in Models
2. Developing User-Written Models
3. Model Validation and Testing

3. Equipment Modelling in PSS/E

1. Transformer Sequence Networks
2. Data Specification and Input
3. Model Calibration and Verification

4. Python for PSS/E Study Automation

1. Introduction to PSS/E Python API
2. Automating Load Flow and Stability Studies
3. Data Extraction and Analysis using Python
4. Custom Tool Development

5. Writing PSS/E User Models in Fortran

1. Basics of Fortran for PSS/E
2. Developing and Integrating Custom Models
3. Debugging and Optimization

6. AEMO OPDMS Integration in PSS/E

1. Overview of AEMO OPDMS
2. Data Import and Export
3. Scenario Analysis and Reporting

7. PSCAD Basics

1. Navigating the Workspace
2. Study Case Management
3. Basic Simulations

8. Equipment Modelling in PSCAD

1. Modelling Machines and Inverters
2. Transmission Lines and Transformers
3. Filters and Other Ancillary Equipment

9. PSCAD for Time-Domain Stability Studies

1. Simulation Control Settings
2. Implementing Timed Logic
3. Stability Analysis Techniques

10. Post-Processing in PSCAD

1. Measurement Elements
2. Data Extraction and Visualization
3. Report Generation

11. Integrating Third-Party Models in PSCAD

1. Model Conversion and Integration
2. Compatibility and Performance Issues

12. Advanced Topics in PSCAD

1. Wide Area Modelling
2. Working with Snapshots
3. Subsystem and Model Development

13. The Electric Network Interface (ENI) in PSCAD

1. Introduction to ENI
2. Implementation and Use Cases
3. Integration with External Systems

Throughout the course, hands-on practical sessions, case studies, and exercises will be incorporated to reinforce the theoretical knowledge with practical application.

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