COURSE OVERVIEW EE1117
PSS/E Stability Analysis

Course Title
PSS/E Stability Analysis

Course Date/Venue
Session 1: May 05-09, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: November 24-28, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
EE1117

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

This course is designed to provide participants with a detailed and up-to-date overview of Power System Simulator for Engineering (PSSE) Stability Analysis. It covers the power system stability, PSSE modules and interfaces including PSSE graphical interface and command line usage; the buses, generators, loads and transmission lines; the transformers, switched shunts, static and dynamic model distinctions, equipment parameter settings and load flow studies in PSSE; and the dynamic data files (DYR), machine models and control systems.

Further, the course will also discuss the load modeling techniques, simulation initialization and validation; the event and disturbance definition and running time-domain simulations; tuning dynamic models for realistic behavior; matching simulated response with real data; the sensitivity to parameter changes and proper documentation and reporting; the transient stability concepts, protection and control coordination and multi-machine system stability; and the application of power system stabilizers (PSS).

During this interactive course, participants will learn the voltage stability analysis, visualizing and reporting stability results and renewable integration and dynamic models; the frequency stability analysis, contingency analysis and stability margins; the FACTS and HVDC systems modeling and model validation using measurement data; the python scripting basics, automating simulations and case setup, batch processing and reporting and custom functions and user-defined tools; and the fine-tuning system response, stability index trends, impact of network reconfiguration and optimizing control schemes.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on power system simulator for engineering (PSSE) stability analysis
- Discuss power system stability, PSSE modules and interfaces including PSSE graphical interface and command line usage
- Identify buses, generators, loads, and transmission lines, transformers and switched shunts, static and dynamic model distinctions and equipment parameter settings
- Recognize load flow studies in PSSE, dynamic data files (DYR), machine models and control systems
- Apply load modeling techniques, simulation initialization and validation as well as describe event and disturbance definition and running time-domain simulations
- Tune dynamic models for realistic behavior, match simulated response with real data, discuss sensitivity to parameter changes and apply proper documentation and reporting
- Discuss transient stability concepts, protection and control coordination, multi-machine system stability and application of power system stabilizers (PSS)
- Carryout voltage stability analysis, visualize and report stability results and illustrate renewable integration and dynamic models
- Apply frequency stability analysis, contingency analysis and stability margins, FACTS and HVDC systems modeling and model validation using measurement data
- Describe python scripting basics, automating simulations and case setup, batch processing and reporting and custom functions and user-defined tools
- Apply fine-tuning system response, evaluate stability index trends, discuss the impact of network reconfiguration and optimize control schemes

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of power system simulator for engineering (PSSE) stability analysis for power system engineers, electrical engineers, system planning engineers, grid operation engineers, stability analysis engineers, energy management system (EMS) specialists, utility company engineers, renewable energy integration engineers, project engineers and managers.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Dr. Ahmed El-Sayed, PhD, MSc, BSc, is a **Senior Electromechanical Engineer** with over **35 years** of extensive experience in the **Power**, **Petroleum**, **Petrochemical** and **Utilities**. He specializes in **HV/LV Equipment**, **High Voltage Electrical Safety**, **LV & HV Electrical System**, **HV Equipments Inspection & Maintenance**, **HV Switchgear Operation & Maintenance**, **LV Distribution Switchgear & Equipment**, **HV Switchgear Maintenance**, **HV/LV Electrical** Authorisation, **Hazardous Area Classification, Power Quality**, **Disturbance Analysis**, **Blackout**, **Power Network**, **Power Distribution**, **Power Systems Control**, **Power Systems Security**, Power **Electronics**, **ETAP**, Electrical **Substations**, Tariff Design & Structure Analysis, **Engineering Drawings, Codes & Standards**, **P&ID Reading, Interpretation & Developing**, **PLC**, **SCADA**, **DCS**, **Process Control**, **Instrumentation**, **Automation**, Power **Generation**, **Process Control Instrumentation**, **SIS**, **SIL**, **ESD**, **Alarm Management Systems**, **Fieldbus Systems** and **Fiber Optics** as well as the service pricing of these. Further, he is also well versed in **Pumps**, **Valves**, **Boilers**, **Pressure Vessels**, **Heat Recovery Steam Generators** (**HRSG**), **Bearings**, **Compressors**, **Motors**, **Turbines**, **Actuators**, **Carbon Footprint**, **Energy Efficiency**, **Power Plant Performance & Efficiency**, **P&ID**, **Engineering Drawing**, **Codes & Standards** and **Hydraulic Systems** He is currently the **Systems Control Manager** of **Siemens** where he is in-charge of Security & Control of Power **Transmission Distribution** & **High Voltage** Systems and he further takes part in the Load Records Evaluation & Transmission Services Pricing.

During his career life, Dr. Ahmed has been actively involved in different Power System Activities including Roles in Power System Planning, Analysis, Engineering, **HV Substation** Design, Electrical Service Pricing, Evaluations & Tariffs, Project Management and also in Teaching and Consulting. His vast industrial experience was honed greatly when he joined many International and National Companies such as **Siemens**, **Electricity Authority** and **ACETO** industries where he focused more on dealing with Technology Transfer, System Integration Process and Improving Localization. He was further greatly involved in manufacturing some of **Power System** and **Control & Instrumentation Components** such as Series of Digital Protection **Relays**, MV **VFD**, **PLC** and **SCADA** System with intelligent features.

Dr. Ahmed is well-versed in different electrical and instrumentation fields like Load Management Concepts, **PLC** Programming, Installation, Operation and Troubleshooting, **AC Drives** Theory, Application and Troubleshooting, Industrial Power Systems Analysis, AC & DC **Motors**, Electric Motor **Protection**, **DCS SCADA**, **Control** and Maintenance Techniques, Industrial Intelligent Control System, **Power Quality** Standards, Power Generators and Voltage Regulators, Circuit Breaker and Switchgear Application and Testing Techniques, **Transformer** and **Switchgear** Application, Grounding for Industrial and Commercial Assets, Power Quality and **Harmonics**, **Protective Relays** (O/C Protection, Line Differential, Bus Bar Protection and **Breaker Failure Relay**) and Project Management Basics (PMB).

Dr. Ahmed has **PhD**, **Master's** & **Bachelor's** degree in **Electrical** and **Instrumentation Engineering** from the **University of Wisconsin Madison**, **USA**. Further, he has numerous papers published internationally in the areas of Power Quality, Superconductive Magnetic Energy Storage, SMES role in Power Systems, Power System **Blackout** Analysis, and Intelligent Load Shedding Techniques for preventing Power System Blackouts, HV **Substation Automation** and Power System Stability.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Fee

US$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Power System Stability Overview*** *Definition and Classification of Stability (Small Signal, Transient, Voltage) • Rotor Angle and Voltage Stability Concepts • Timescales of Dynamic Phenomena • Importance of Stability in Modern Power Systems*
0930 – 0945	*Break*
0945 – 1030	***Overview of PSSE Software*** *Introduction to PSSE Modules and Interfaces • Key Features of Dynamics and Stability Simulation • File Structure and Input/Output Conventions • Licensing and Installation Basics*
1030 – 1130	***PSSE User Interface & Workflow*** *PSSE Graphical Interface and Command Line Usage • Navigating Project Setup and Model Loading • Data Import/Export (Raw, DYR, Sav Files) • Batch and Interactive Simulation Options*
1130 – 1215	***Modeling Power System Components*** *Buses, Generators, Loads, and Transmission Lines • Transformers and Switched Shunts • Static and Dynamic Model Distinctions • Equipment Parameter Settings*
1215 – 1230	*Break*

1230 – 1330	***Load Flow Studies in PSSE*** *Solving the Base Case Power Flow • Slack Bus and Control Options • Using Auxiliary Files for Initialization • Troubleshooting Convergence Issues*
1330 – 1420	***Basics of Dynamic Data Files (DYR)*** *Structure and Syntax of DYR Files • Associating Models with Network Components • Interpreting Dynamic Records • Preparing for Stability Simulations*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Machine Models & Control Systems*** *GENROU, GENCLS, GENSAL Models • Excitation System Models (IEEET1, EXST1, etc.) • Governor Models (IEEEG1, TGOV1, HYGOV) • Power System Stabilizer (PSS2A, PSS1A)*
0830 – 0930	***Load Modeling Techniques*** *Static versus Dynamic Load Models • ZIP Model, Frequency and Voltage Dependence • Composite Load Models • Motor Load Modeling*
0930 – 0945	*Break*
0945 – 1100	***Simulation Initialization & Validation*** *Ensuring Data Consistency Between Load Flow and Dynamic Data • Run Flat Start and Steady-State Initialization • Checking Machine Angles and Speeds • Diagnostic Tools for Validation*
1100 – 1215	***Event & Disturbance Definition*** *Adding Faults (3-Phase, Single-Line-to-Ground, etc.) • Switching Actions (Opening/Closing Breakers) • Line Trips and Generator Outages • Sequence and Timing of Dynamic Events*
1215 – 1230	*Break*
1230 – 1330	***Running Time-Domain Simulations*** *• Simulation Parameters (Time Step, Stop Time) • Interpreting Outputs: Angles, Speeds, Voltages • Plotting and Exporting Dynamic Results • Case Comparison and Result Validation*
1330 – 1420	***Model Calibration & Verification*** *• Tuning Dynamic Models for Realistic Behavior • Matching Simulated Response with Real Data • Sensitivity to Parameter Changes • Documentation and Reporting*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Transient Stability Concepts*** *Response to Large Disturbances • Critical Clearing Time and Angle Deviation • Swing Curves and Damping Behavior • Impact of Inertia and System Strength*
0830 – 0930	***Protection & Control Coordination*** *Relay Coordination with Transient Events • Under-Frequency and Over-Voltage Tripping • Load Shedding Schemes • Dynamic Brake and Fast Valving Simulation*
0930 – 0945	*Break*
0945 – 1100	***Multi-Machine System Stability*** *Inter-Area Oscillations • System-Wide Angle Stability • Identifying Weak Buses and Modes • Analyzing Machine-to-Machine Interactions*
1100 – 1215	***Application of Power System Stabilizers (PSS)*** *PSS Design Principles • Impact on Damping of Oscillations • Tuning and Testing within PSS®E • Comparative Studies with and without PSS*
1215 – 1230	*Break*
1230 – 1330	***Voltage Stability Analysis*** *Dynamic Voltage Support • Impact of Reactive Power Sources • Load Dynamics and Voltage Collapse • Use of FACTS Devices (SVC, STATCOM) in Simulations*
1330 – 1420	***Visualization & Reporting of Stability Results*** *Plot Customization and Interpretation • Exporting to Excel and Reports • Automatic Report Generation • Case Documentation Practices*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Renewable Integration & Dynamic Models*** *Wind and Solar Plant Modeling (WT3G2, REGCA1) • Control Characteristics (Inverter-Based Resources) • Fault Ride-Through Capabilities • System Inertia Reduction Impacts*
0830 – 0930	***Frequency Stability Analysis*** *Frequency Response and Regulation • Inertia and Primary Control • Under-Frequency Load Shedding (UFLS) • Simulation of Frequency Excursions*
0930 – 0945	*Break*
0945 – 1100	***Contingency Analysis & Stability Margins*** *N-1 and N-2 Contingency Evaluation • Automatic Event Looping • Quantifying System Robustness • Remedial Action Schemes*
1100 – 1215	***FACTS & HVDC Systems Modeling*** *SVC, STATCOM, TCSC Modeling • HVDC Link Representation (LCC and VSC) • Control System Interactions • System Dynamic Response to FACTS Devices*
1215 – 1230	*Break*
1230 – 1330	***Model Validation Using Measurement Data*** *PMU and SCADA Data for Benchmarking • Case Reconstruction from Disturbance Records • Error Analysis and Correction • Adjusting for Real-World Variability*

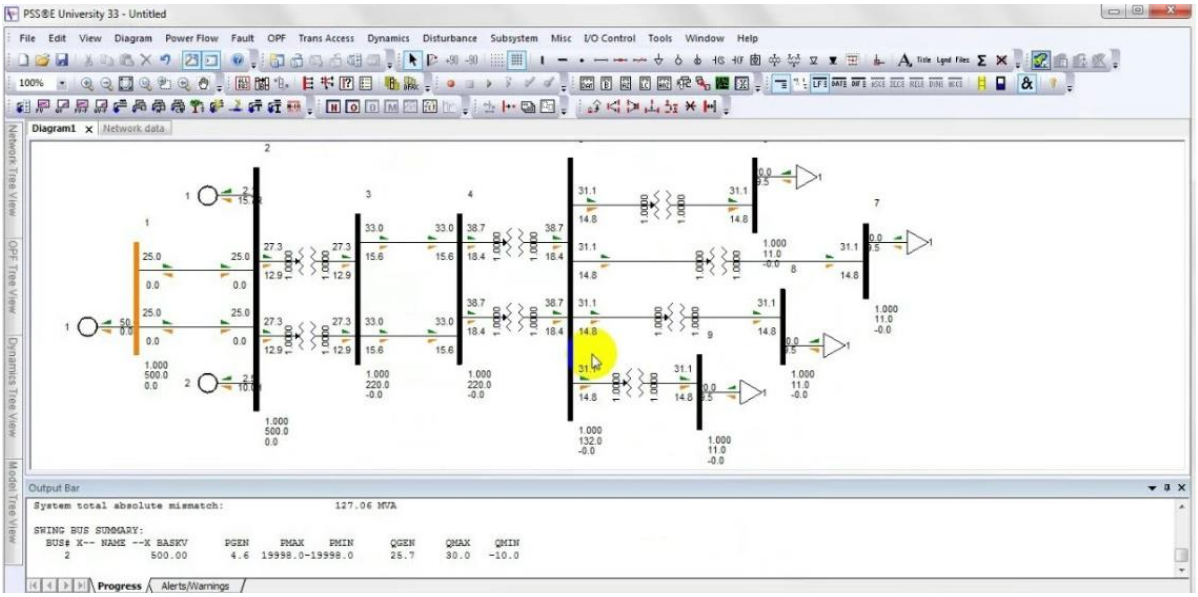
1330 – 1420	***Scripting & Automation in PSSE*** *Python Scripting Basics • Automating Simulations and Case Setup • Batch Processing and Reporting • Custom Functions and User-Defined Tools*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Company-Specific Power System Modeling*** *Overview of Company System Characteristics • Modeling Generation and Transmission Topology • Load Profiles and Renewable Mix • Region-Specific Control Settings*
0830 – 0930	***Hands-On: Fault Analysis & Mitigation*** *Simulating Generator and Line Faults • Determining Critical Clearing Time • Applying Corrective Controls • Interpretation of Results*
0930 – 0945	*Break*
0945 – 1100	***Case Study: Islanding & System Restoration*** *Intentional Islanding Strategy • Dynamic Reconnection Techniques • Load-Generation Balance After Fault • Black Start and Ramping Scenarios*
1100 - 1230	***Project: Renewable Scenario Integration*** *Simulate High Renewable Penetration • Assess Stability Margin Degradation • Evaluate Impact of Inertia Reduction • Mitigation with Synthetic Inertia and Storage*
1230 – 1245	*Break*
1245 – 1345	***Performance Assessment & Optimization*** *Fine-Tuning System Response • Evaluating Stability Index Trends • Impact of Network Reconfiguration • Optimizing Control Schemes*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators “PSSE” software.



PSSE Software

Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org