COURSE OVERVIEW EE0578
Optimal Power Flow Training on PSSE

Course Title
Optimal Power Flow Training on PSSE

Course Date/Venue
October 07-11, 2024/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
EE0578

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 Optimal Power Flow on Power System Simulator for Engineering (PSSE). It covers the capabilities and applications of PSSE in power system analysis; the PSSE user interface and fundamentals of power systems and optimal power flow (OPF); setting up power system model in PSSE and load flow analysis to understand system behavior under normal operating conditions; the generator, load modeling, transmission network modeling and dynamic modeling; creating, managing and analyzing multiple scenarios for OPF studies; and managing and exchanging data within PSSE and with other applications.

During this interactive course, participants will learn the algorithms used for OPF analysis including linear and nonlinear optimization techniques; configuring OPF in PSSE and managing constraints like the voltage limits, branch flow limits and generator output limits; setting-up cost functions for generation and interpreting the results of OPF studies; the sensitivity analysis and its application in OPF including contingency analysis, renewable energy integration and voltage stability and control; the common problems encountered during OPF analysis in PSSE; the software extensions and add-ons for enhanced OPF analysis; and dealing with uncertainty in OPF such as load forecasting errors and renewable variability.

Course Objectives

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

- Apply and gain an in-depth knowledge on optimal power flow on power system simulator for engineer (PSSE)
- Discuss the capabilities and applications of PSSE in power system analysis
- Navigate PSSE user interface and discuss the fundamentals of power systems and optimal power flow (OPF)
- Set-up power system model in PSSE and apply load flow analysis to understand system behavior under normal operating conditions
- Illustrate detailed generator and load modeling, transmission network modeling and dynamic modeling
- Create, manage and analyze multiple scenarios for OPF studies as well as manage and exchange data within PSSE and with other applications
- Discuss the algorithms used for OPF analysis including linear and nonlinear optimization techniques
- Configure OPF in PSSE and manage constraints like the voltage limits, branch flow limits and generator output limits
- Set-up cost functions for generation as well as analyze and interpret the results of OPF studies
- Carryout sensitivity analysis and its application in OPF including contingency analysis, renewable energy integration and voltage stability and control
- Identify and resolve common problems encountered during OPF analysis in PSSE
- Explore software extensions and add-ons for enhanced OPF analysis and deal with uncertainty in OPF such as load forecasting errors and renewable variability

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, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a **Tablet PC**.*

Who Should Attend

This course provides an overview of all significant aspects and considerations of optimal power flow on PSSE for electrical engineers, power systems analysts, power system planners, power system operators, researchers and academics, consultants.

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.

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: -

- 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.

- 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.

Accommodation

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

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 Electrical & Instrumentation Engineer** with **35 years** of extensive experience within the **Oil**, **Gas**, **Power**, **Petroleum**, **Petrochemical** and **Utilities** industries. His experience widely covers in the areas of Advanced Distributed Control System (**DCS**), **DCS** Operation & Configuration, **DCS** Troubleshooting, **DCS Yokogawa** ProSafe-RS Safety Instrumented System, **DCS Yokogawa** Centum VP, **DCS Emerson** DeltaV, **DCS GE Mark VI**, Programable Logic Controller (**PLC**), Supervisory Control & Data Acquisition (**SCADA**) Systems, Siemens **PLC Simatic S7-400/S7-300/S7-200**, **Siemens SIMATIC S7** Maintenance & Configuration, **Siemens WINCC**, SCADA System: Siemens **SIMATIC & WinCC**, **Process Control**, **Control Systems & Data Communications**, **Instrumentation**, **Automation**, **Valve Tuning**, Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), **Telemetry** Systems, **Boiler Control & Instrumentation**, Advanced Process Control (**APC**) Technology, Practical **Fiber-Optics** Technology, **Compressor** Control & Protection, **GE Gas Turbines**, **Alarm** Management Systems, **Engine** Management System, **Fieldbus** Systems, **NEC** (National Electrical Code), **NESC** (National Electrical Safety Code), **Electrical Safety**, **Electrical Hazards** Assessment, **Electrical Equipment**, Electrical Transient Analysis Program (**ETAP**), Power **Quality**, Power **Network**, Power **Distribution**, **Distribution Systems**, **Power Systems Control**, **Power Systems Security**, Power **Electronics**, **Power System** Harmonics, **Power System** Planning, Control & Stability, **Power Flow** Analysis, **Smart Grid & Renewable** Integration, **Power System Protection & Relaying**, Economic Dispatch & Grid Stability Constraints in Power Plants, Electrical Demand Side Management (DSM), Electrical **Substations**, **Substation Automation** Systems & Application (IEC 61850), **Distribution Network** System Design, **Distribution Network Load**, Electrical **Distribution** Systems, **Load Forecasting** & System Upgrade (Distribution), **Overhead Power Line** Maintenance & Patrolling, High Voltage **Switching** Operations, Industrial **UPS Systems & Battery** Power Supplies, Electric **Motors & Variable Speed Drives**, **Generator** Maintenance & Troubleshooting, **Generator** Excitation Systems & AVR, **Transformer** Maintenance & Testing, Lock-Out & Tag-Out (**LOTO**), Confined Workspaces and **Earthing & Grounding**, 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, Teaching and Consulting. His vast industrial experience was honed greatly when he joined many International and National Companies such as **Siemens**, **Electricity Authority**, Egyptian Electricity Holding, Egyptian Refining Company (ERC), **GASCO**, Tahrir Petrochemicals Project, and **ACETO** industries as the **Instrumentation & Electrical Service Project Manager**, **Energy Management Engineer**, **Department Head**, **Assistant Professor**, **Project Coordinator**, **Project Assistant and Managing Board Member** 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 has **PhD**, **Master** & **Bachelor** degrees in **Electrical Engineering** from the **University of Wisconsin Madison**, **USA** and **Ain Shams University**, respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/ Assessor/Trainer** by the **Institute of Leadership and Management** (**ILM**), an active member of IEEE and ISA as well as numerous technical and scientific 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 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: ***Monday, 07th of October 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of PSSE Software**: Introduction to PSSE, Its Capabilities & Applications in Power System Analysis*
0930 – 0945	*Break*
0945 – 1030	***Navigating the PSSE User Interface**: Familiarization with the PSSE Environment, Menus, Toolbars & Basic Commands*
1030 – 1130	***Fundamentals of Power Systems**: Review of Key Power System Concepts, Including Generation, Transmission & Distribution*
1130 – 1215	***Optimal Power Flow (OPF)**: The Purpose, Benefits & Basic Theory Behind OPF*
1215 – 1230	*Break*
1230 – 1330	***Setting Up a Power System Model in PSSE**: Step-By-Step Guidance on Creating & Importing Power System Models*
1330 – 1420	***Load Flow Analysis Basics**: Performing Basic Load Flow Studies in PSSE to Understand System Behavior Under Normal Operating Conditions*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: ***Tuesday, 08th of October 2024***

0730 – 0830	***Detailed Generator & Load Modeling**: Techniques for Accurately Modeling Generators & Loads Within PSSE for OPF Studies*
0830 – 0930	***Transmission Network Modeling**: Approaches for Modeling Complex Transmission Networks, Including Line Impedances & Transformer Ratings*
0930 – 0945	*Break*
0945 – 1100	***Dynamic Modeling**: Basics of Dynamic Modeling in PSSE for Transient Stability Analysis*
1100 – 1215	***Creating & Managing Scenarios**: How to Create, Manage & Analyze Multiple Scenarios for OPF Studies*
1215 – 1230	*Break*

1230 – 1330	***Data Management & Exchange**: Best Practices for Managing & Exchanging Data Within PSSE & With Other Applications*
1330 – 1420	***Hands-On Exercise**: Building a Comprehensive Model: Participants will Work on Constructing a Detailed Power System Model in PSSE*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3: Wednesday, 09th of October 2024

0730 – 0830	***OPF Theory & Algorithms**: The Algorithms Used for OPF Analysis, Including Linear & Nonlinear Optimization Techniques*
0830 – 0930	***Configuring OPF in PSSE**: Detailed Instructions on Setting Up & Configuring OPF Studies In PSSE*
0930 – 0945	*Break*
0945 – 1100	***Constraint Handling in OPF**: How to Define & Manage Constraints such as Voltage Limits, Branch Flow Limits & Generator Output Limits*
1100 – 1215	***Cost Functions & Objective Setting**: Understanding & Setting Up Cost Functions for Generation & The Objectives of OPF*
1215 – 1230	*Break*
1230 – 1330	***Analyzing OPF Results**: Techniques for Analyzing & Interpreting the Results of OPF Studies*
1330 – 1420	***Hands-On Exercise**: Performing an OPF Study: Participants will Conduct an OPF Study on the Model Built, Focusing on Optimizing Generation Cost While Meeting Demand & Operational Constraints*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4: Thursday, 10th of October 2024

0730 – 0830	***Sensitivity Analysis & Its Application in OPF**: Exploring How Sensitivity Analysis Can Aid in Understanding & Improving OPF Outcomes*
0830 – 0930	***Contingency Analysis in OPF Studies**: Performing Contingency Analysis Within the Context of OPF to Evaluate System Robustness*
0930 – 0945	*Break*
0945 – 1100	***Renewable Energy Integration in OPF**: Considerations for Integrating Renewable Energy Sources into OPF Studies*
1100 – 1215	***Voltage Stability & Control in OPF**: Addressing Voltage Stability & Control Issues Through OPF*
1215 – 1230	*Break*
1230 – 1330	***Troubleshooting Common Issues in OPF Studies**: Identifying & Resolving Common Problems Encountered During OPF Analysis in PSSE*
1330 – 1420	***Hands-On Exercise: Advanced OPF Analysis**: Participants Tackle a Complex OPF Study, Incorporating Contingency Analysis & Renewable Integration*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

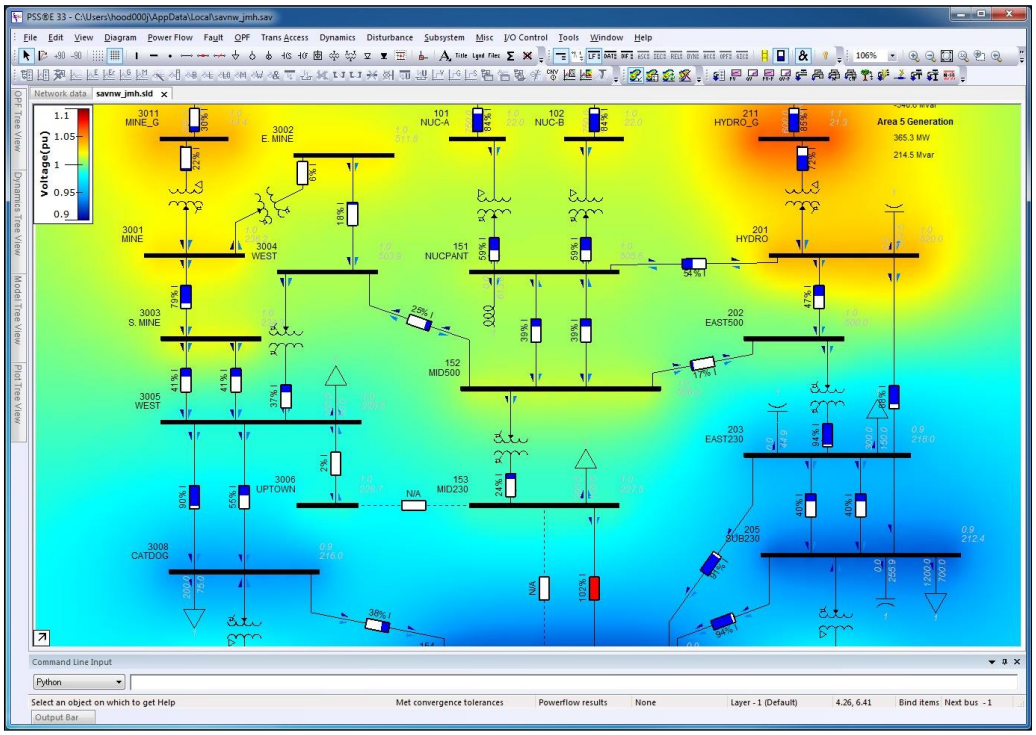
Day 5: Friday, 11th of October 2024

0730 – 0830	***Exploring PSSE Extensions for OPF**: Overview of Software Extensions & Add-Ons for Enhanced OPF Analysis*
0830 – 0930	***Optimization Under Uncertainty**: Discussing Strategies for Dealing with Uncertainty in OPF, such as Load Forecasting Errors & Renewable Variability*
0930 – 0945	*Break*

0945 – 1100	***Case Studies**: Reviewing Real-World Examples of OPF Application in Power System Operation & Planning*
1100 – 1230	***Best Practices for OPF Studies in PSSE**: Consolidating Learnings into Best Practices for Conducting Efficient & Accurate OPF Studies*
1230 – 1245	*Break*
1245 – 1345	***Q&A & Discussion on OPF Challenges**: Open Forum for Participants to Discuss Challenges Faced in OPF Studies & Share Experiences*
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulators (Hands-on Practical Sessions)

Practical session 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 the simulator "PSSE Software".



PSSE Software

Course Coordinator

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