COURSE OVERVIEW EE1195
FACTS Devices & Power Flow Control

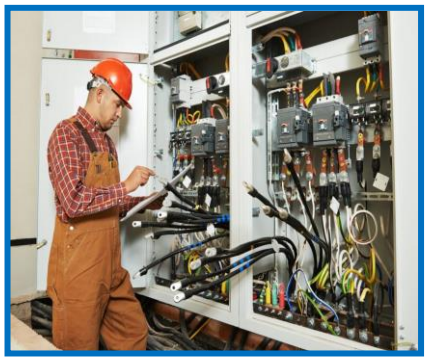
Course Title
FACTS Devices & Power Flow Control

Course Date/Venue
September 21-25, 2026/TBA Meeting Room, InterContinental Abu Dhabi, Abu Dhabi, UAE

Course Reference
EE1195

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 Flexible Alternating Current Transmission Systems (FACTS) Devices and Power Flow Control. It covers the power flow in transmission systems, reactive power and voltage control and limitations of conventional transmission; the FACTS devices, types of FACTS controllers and power electronics in FACTS; the static VAR compensator (SVC), static synchronous compensator (STATCOM), thyristor controlled series capacitor (TCSC) and static synchronous series compensator (SSSC); comparing shunt versus series devices and the modeling of FACTS devices; the unified power flow controller (UPFC) and interline power flow controller (IPFC); and the power flow control using FACTS and FACTS in stability enhancement.

During this interactive course, participants will learn the renewable integration and economic benefits of FACTS; the control strategies for FACTS devices, coordination of multiple FACTS devices and FACTS in optimal power flow (OPF); the dynamic simulation of FACTS, integration with protection systems and installation and practical considerations; the FACTS in smart grids, comparison with HVDC systems and emerging technologies; and the high capital cost, control complexity, operational challenges and cybersecurity considerations.

Course Objectives/Outcomes & Benefits for the Participants

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

- Apply and gain an in-depth knowledge on FACTS devices and power flow control
- Discuss power flow in transmission systems, reactive power and voltage control and limitations of conventional transmission
- Identify FACTS devices, types of FACTS controllers and power electronics in FACTS
- Recognize static VAR compensator (SVC), static synchronous compensator (STATCOM), thyristor controlled series capacitor (TCSC) and static synchronous series compensator (SSSC)
- Compare shunt versus series devices and describe the modeling of FACTS devices
- Determine unified power flow controller (UPFC), interline power flow controller (IPFC), power flow control using FACTS and FACTS in stability enhancement
- Apply renewable integration and identify economic benefits of FACTS
- Carryout control strategies for FACTS devices, coordination of multiple FACTS devices and FACTS in optimal power flow (OPF)
- Apply dynamic simulation of FACTS, integration with protection systems and installation and practical considerations
- Identify FACTS in smart grids, comparison with HVDC systems and emerging technologies
- Discuss high capital cost, control complexity, operational challenges and cybersecurity considerations

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 FACTS devices and power flow control for power system planners and operators, transmission and distribution engineers, utility engineers and grid operators, protection and control engineers, electrical power engineers, renewable energy integration specialists, SCADA and automation engineers, consultants involved in transmission planning and optimization, professionals working in smart grids and energy systems, researchers and academicians in power systems, EPC and power infrastructure engineers and other technical staff.

Accommodation

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

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

Haward's 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**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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 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 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 over **30 years** of extensive experience in the **Power**, **Petroleum**, **Petrochemical** and **Utilities**. He specializes in **Circuit Breaker**, **Breaker** Replacement Strategy, Digitalization & **Smart Breakers**, Advanced Arc Quenching Technology, **Circuit Breaker** in Petroleum Facilities, **Breaker** Failures & Protection, Electrical Testing of **Circuit Breaker, HV/LV Equipment**, **High Voltage Electrical Safety**, **LV & HV Electrical System**, **HV Equipment's Inspection & Maintenance**, **HV Switchgear Operation & Maintenance**, **LV Distribution Switchgear & Equipment**, **HV Switchgear Maintenance**, **HV/LV Electrical** Authorization, **Hazardous Area Classification, Power Quality**, **Disturbance Analysis**, **Blackout**, **Power Flow** in Transmission Systems, **FACTS** Devices & Controllers, Power Electronics in **FACTS**, Unified Power Flow Controller (**UPFC**), **Power Network**, **Power Distribution**, Power System **Frequency**, **Swing Equation & Frequency** Response, Load-Frequency Control (**LFC**), Primary & Secondary **Frequency Control**, Classification of **Ancillary Services**, **Power Systems Control**, **Power Systems Security**, Power System **Dynamics**, 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. 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.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

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, 21st of September 2026***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Power Flow in Transmission Systems*** *Real and Reactive Power Flow Concepts • Power-Angle Relationship • Role of Transmission Impedance • Limitations of Conventional Power Systems*
0930 – 0945	*Break*
0945 – 1030	***Reactive Power & Voltage Control*** *Importance of Reactive Power • Voltage Profile Management • Sources of Reactive Power • Impact on System Stability*
1030 – 1130	***Limitations of Conventional Transmission*** *Thermal Limits • Voltage Stability Limits • Stability Constraints • Need for Controllability*
1130 – 1215	***Basics of FACTS Devices*** *Definition and Objectives • Evolution of FACTS Technology • Benefits (Flexibility, Stability, Capacity) • Classification Overview*
1215 – 1230	*Break*
1230 – 1330	***Types of FACTS Controllers*** *Series Controllers • Shunt Controllers • Combined Controllers • Hybrid Configurations*
1330 – 1420	***Power Electronics in FACTS*** *Role of Thyristors and IGBTs • Switching Techniques • Voltage Source Converters (VSC) • Control Principles*
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: **Tuesday, 22nd of September 2026**

0730 – 0830	***Static VAR Compensator (SVC)*** *Operating Principle • Components (TCR, TSC) • Voltage Regulation • Applications and Limitations*
0830 – 0930	***Static Synchronous Compensator (STATCOM)*** *VSC-Based Operation • Reactive Power Control • Advantages Over SVC • Dynamic Performance*
0930 – 0945	*Break*
0945 – 1100	***Thyristor Controlled Series Capacitor (TCSC)*** *Series Compensation Basics • Control of Line Reactance • Power Flow Control • Stability Improvement*
1100 – 1215	***Static Synchronous Series Compensator (SSSC)*** *VSC-Based Series Compensation • Voltage Injection Principle • Control Strategies • Applications*
1215 – 1230	*Break*
1230 – 1330	***Comparison of Shunt versus Series Devices*** *Functional Differences • Performance Characteristics • Cost Considerations • Application Scenarios*
1330 – 1420	***Modeling of FACTS Devices*** *Steady-State Models • Dynamic Models • Representation in Load Flow Studies • Simplifications and Assumptions*
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: **Wednesday, 23rd of September 2026**

0730 – 0830	***Unified Power Flow Controller (UPFC)*** *Structure and Components • Simultaneous Control of Voltage, Impedance, Angle • Operating Modes • Practical Applications*
0830 – 0930	***Interline Power Flow Controller (IPFC)*** *Concept and Operation • Multi-Line Power Flow Control • Benefits and Limitations • Coordination Between Lines*
0930 – 0945	*Break*
0945 – 1100	***Power Flow Control Using FACTS*** *Controlling Real and Reactive Power • Load Balancing • Congestion Management • Enhancing Transfer Capability*
1100 – 1215	***FACTS in Stability Enhancement*** *Improving Transient Stability • Damping Oscillations • Voltage Stability Improvement • Dynamic Response Support*
1215 – 1230	*Break*
1230 – 1330	***FACTS for Renewable Integration*** *Managing Variability of Renewables • Voltage Support for Wind/Solar • Grid Flexibility • Hybrid Systems*
1330 – 1420	***Economic Benefits of FACTS*** *Increased Transmission Capacity • Deferred Infrastructure Investment • Loss Reduction • Cost-Benefit Analysis*
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*

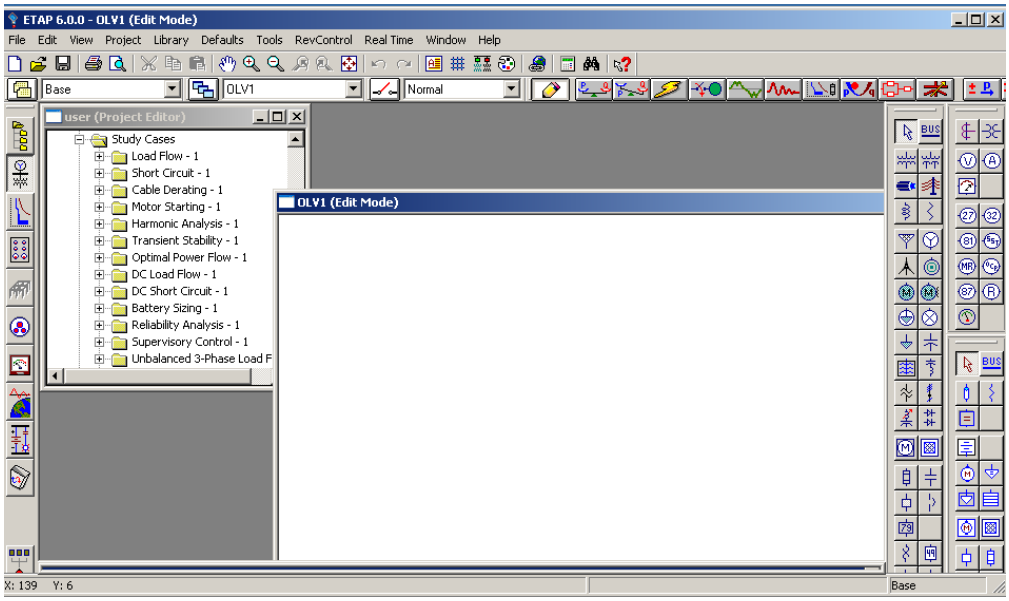
Day 4:	Thursday, 24th of September 2026
0730 – 0830	***Control Strategies for FACTS Devices*** *Open-Loop versus Closed-Loop Control • PI/PID Controllers • Advanced Control Techniques • Stability Considerations*
0830 – 0930	***Coordination of Multiple FACTS Devices*** *Interaction Between Devices • Control Coordination Strategies • Avoiding Adverse Interactions • Multi-Device Optimization*
0930 – 0945	*Break*
0945 – 1100	***FACTS in Optimal Power Flow (OPF)*** *Incorporating FACTS into OPF • Objective Functions and Constraints • Optimization of Device Settings • Impact on System Performance*
1100 – 1215	***Dynamic Simulation of FACTS*** *Time-Domain Simulation • Disturbance Response Analysis • Performance Evaluation • Software Tools (MATLAB, Powerfactory)*
1215 – 1230	*Break*
1230 – 1330	***Integration with Protection Systems*** *Impact on Relay Operation • Coordination Challenges • Protection Scheme Adaptation • Reliability Considerations*
1330 – 1420	***Installation & Practical Considerations*** *Site Selection • Installation Challenges • Commissioning Procedures • Maintenance Requirements*
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:	Friday, 25th of September 2026
0730 – 0830	***Case Studies of FACTS Applications*** *SVC/STATCOM Installations • UPFC Deployment Examples • Congestion Management Cases • Lessons Learned*
0830 – 0930	***FACTS in Smart Grids*** *Role in Modern Grid Architecture • Integration with Digital Systems • Real-Time Monitoring and Control • Smart Grid Applications*
0930 – 0945	*Break*
0945 – 1100	***Comparison with HVDC Systems*** *AC versus DC Transmission • FACTS versus HVDC Capabilities • Hybrid Systems • Application Scenarios*
1100 – 1215	***Emerging Technologies*** *Modular Multilevel Converters (MMC) • Advanced Semiconductor Devices • AI-Based Control • Hybrid FACTS Solutions*
1215 – 1230	*Break*
1230 – 1300	***Challenges in FACTS Implementation*** *High Capital Cost • Control Complexity • Operational Challenges • Cybersecurity Considerations*

1300 - 1345	***Capstone Project & Evaluation*** *Designing a FACTS-Based Solution • Selecting Appropriate Device • Analyzing Impact on Power Flow • Presenting Results and Recommendations*
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 simulator "ETAP Software".



ETAP Software

Course Coordinator

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