COURSE OVERVIEW EE1108
Power Generation & Transmission

Course Title
Power Generation & Transmission

Course Date/Venue
Session 1: May 05-09, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: September 08-12, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
EE1108

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 Generation and Transmission. It covers the power generation technologies, thermodynamics in power generation, thermal power plants and nuclear and hydro power basics; the renewable energy integration, power use in desalination, cogeneration with power plants and energy optimization strategies; the steam turbines, gas turbines, combined-cycle gas turbine (CCGT) plants, generators and excitation systems and boilers and heat recovery systems; and the auxiliary and balance-of-plant systems, environmental compliance in generation and power transmission.

Further, the course will also discuss the transmission lines and towers, substations and switchyards, power transformers and high voltage equipment; the reactive power and voltage control, grid operation and control centers and power system stability; the fault analysis and protection schemes, grid code and compliance and interconnection and power exchange; and the power quality management, load forecasting and demand planning, transmission system planning and digitalization in generation and transmission.

During this interactive course, participants will learn the renewable integration into grid covering grid codes for renewables, curtailment and smoothing techniques; the battery and hybrid storage and advanced forecasting tools; and the cybersecurity in power systems comprising of threats to SCADA/EMS systems, cyber-physical risk management, (NERC CIP, IEC 62443) standards and incident response planning.

Course Objectives

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

- Apply and gain a good working knowledge on power generation and transmission
- Discuss power generation technologies, thermodynamics in power generation, thermal power plants and nuclear and hydro power basics
- Carryout renewable energy integration, power use in desalination, cogeneration with power plants and energy optimization strategies
- Recognize steam turbines, gas turbines and combined cycle gas turbine (CCGT) plants, generators and excitation systems and boilers and heat recovery systems
- Discuss auxiliary and balance-of-plant systems, environmental compliance in generation and power transmission
- Identify transmission lines and towers, substations and switchyards, power transformers and high voltage equipment
- Describe reactive power and voltage control, grid operation and control centers and power system stability
- Apply fault analysis and protection schemes, grid code and compliance and interconnection and power exchange
- Employ power quality management, load forecasting and demand planning, transmission system planning and digitalization in generation and transmission
- Discuss renewable integration into grid covering grid codes for renewables, curtailment and smoothing techniques, battery and hybrid storage and advanced forecasting tools
- Recognize cybersecurity in power systems comprising of threats to SCADA/EMS systems, cyber-physical risk management, (NERC CIP, IEC 62443) standards and incident response planning

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 generation and transmission for electrical engineers, mechanical engineers, energy engineers, power system engineers, project managers, technicians and maintenance personnel and other technical staff.

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 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 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:

Mr. Pan Marave, PE, MSc, BEng, is a **Senior Electrical & Instrumentation Engineer** with over **30 years** of extensive experience in **Generator Excitation Systems** & **AVR**, **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise includes **CEMS** Operations and Maintenance, **ABB 11KV Distribution Switchgear**, Operation & Maintenance of **Rotork make MOVS**, **Maintaining Instrument Air Compressors**, **Circuit Breaker**, **HV Switchgear Maintenance**, **HV/LV Electrical** Authorisation, Basic **Electricity**, **Electrical & Special Hazards**, **Personnel Protection**, **HV/LV Equipment**, **Motor Controllers**, **Electrical Switching** Practices, **Emergency Planning**, **Safety Management**, Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**); **DCS**, **SCADA** & **PLC**; **Measurement** (**Flow**, **Temperature**, **Pressure**); **Process Analyzers** & **Analytical Instrumentation**; **Process Control**, **Instrumentation** & **Safeguarding**; **Process Controller**, **Control Loop & Valve Tuning**; Industrial **Distribution Systems**; Industrial **Control & Control Systems**, Power Systems **Protection & Relaying**; **Earthing**, **Bonding**, **Grounding**, **Lightning & Surge Protection**; Electric Power **Substation** & **Systems**; Electrical Engineering Principles; **Motor Control Circuit**; **Electrical Fault Analysis**; Electrical Networks & Distribution **Cables**; **Circuit Breakers**, **Switchgears**, **Transformers**, **Hazardous Areas Classification** and **Detailed Engineering Drawings**, **Codes** & **Standards**. Furthermore, he is also well-versed in Microprocessors Structure, Lead Auditor (**ISO 9000:2000**), **ISO 9002**, Quality Assurance, and Projects & Contracts Management.

Presently, Mr. Marave is the **Technical Advisor** of **Chamber of Industry & Commerce** in Greece. Prior to this, he gained his thorough practical experience through several positions as the **Technical Instructor**, **Engineering Manager**, **Electronics & Instruments Head**, **Electrical**, **Electronics & Instruments Maintenance Superintendent**, **Assistant General Technical Manager** and **Engineering Supervisor** of various international companies such as the **Alumil** Mylonas, **Athens Papermill**, **Astropol** and the **Science Technical Education**.

Mr. Marave is a **Registered Professional Engineer** and has **Master's** and **Bachelor's** degrees in **Electrical Engineering** from the **Polytechnic Institute of New York** and **Pratt Institute of New York** (**USA**) respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and an active member of the **Technical Chamber** and the Institute of Electrical and Electronics Engineer (**IEEE**) in Greece. He has presented and delivered **numerous international** courses, conferences, trainings and workshops worldwide.

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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Power Generation Technologies*** *Conventional versus Renewable Generation • Thermal, Nuclear, Hydro & Solar • Global & Regional Trends • Role in Integrated Power Systems*
0930 – 0945	*Break*
0945 – 1030	***Thermodynamics in Power Generation*** *First & Second Laws of Thermodynamics • Heat Engine Cycles (Rankine, Brayton) • Efficiency Considerations • Losses in Energy Conversion*
1030 – 1130	***Thermal Power Plants*** *Coal-Fired & Gas-Fired Plants • Combined Cycle Gas Turbines (CCGT) • Fuel Sources & Combustion Process • Emission Control & Heat Recovery*
1130 – 1215	***Nuclear & Hydro Power Basics*** *Nuclear Fission Principles • Types of Reactors • Hydro Turbine Systems • Environmental & Safety Concerns*
1215 – 1230	*Break*
1230 – 1330	***Renewable Energy Integration*** *Solar PV & CSP Basics • Wind Energy Systems • Grid-Scale Storage Systems • Challenges of Variability*
1330 – 1420	***Desalination Power-Water Link*** *Power Use in Desalination (RO/MSF/MED) • Cogeneration with Power Plants • Energy Optimization Strategies • Integration Challenges in UAE*
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	***Steam Turbines*** *Types & Operation Principles • Expansion Stages & Control • Governing Systems • Maintenance Considerations*
0830 – 0930	***Gas Turbines & CCGT Plants*** *Gas Turbine Operation & Layout • Compressor-Combustor-Turbine Sections • HRSG & Steam Cycle in CCGT • Load Following & Efficiency*
0930 – 0945	*Break*
0945 – 1100	***Generators & Excitation Systems*** *Synchronous Generator Basics • Excitation & AVR Systems • Cooling Systems (Air/Hydrogen/Water) • Generator Protection Mechanisms*
1100 – 1215	***Boilers & Heat Recovery Systems*** *Boiler Types & Classifications • Combustion & Fuel Feeding • HRSG Configurations • Heat Transfer Surfaces*
1215 – 1230	*Break*
1230 – 1330	***Auxiliary & Balance-of-Plant Systems*** *Condensers & Cooling Towers • Fuel Handling Systems • Lubrication & Sealing • Water Treatment Units*
1330 – 1420	***Environmental Compliance in Generation*** *SOx, NOx & CO2 Emissions • Stack Monitoring Systems • Carbon Capture Potential • UAE Environmental Regulations*
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	***Basics of Power Transmission*** *Power System Layout • High Voltage AC & DC Transmission • Bulk Transmission Systems • Load Flow from Generation to Consumers*
0830 – 0930	***Transmission Lines & Towers*** *Conductor Types & Selection • Insulators & Support Structures • Corona Discharge & Shielding • Transmission Line Ratings*
0930 – 0945	*Break*
0945 – 1100	***Substations & Switchyards*** *AIS versus GIS Substations • Key Equipment Overview (CTs, PTs, CBs) • Busbar Configurations • Grounding & Lightning Protection*
1100 – 1215	***Power Transformers*** *Types & Classifications • Tap Changers & Voltage Regulation • Cooling Methods & Oil Systems • Protection & Monitoring*
1215 – 1230	*Break*
1230 – 1330	***High Voltage Equipment*** *Circuit Breakers & Disconnectors • Surge Arresters • Instrument Transformers • Earthing Switches & Safety Systems*

1330 – 1420	***Reactive Power & Voltage Control*** *Importance of Reactive Power • Shunt & Series Compensation • SVC & STATCOM Systems • Load Balancing Techniques*
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	***Grid Operation & Control Centers*** *Role of Dispatch & Load Control • SCADA Systems in Real-Time Monitoring • Load Dispatch Planning • System Frequency Control*
0830 – 0930	***Power System Stability*** *Types of Stability (Voltage, Rotor Angle) • Transient versus Steady-State Conditions • Dynamic Simulation Tools • Preventive & Corrective Actions*
0930 – 0945	*Break*
0945 – 1100	***Fault Analysis & Protection Schemes*** *Types of Faults (L-L, L-G, 3-Phase) • Protective Relay Types & Settings • Coordination & Selectivity • Breaker-Failure & Backup Protection*
1100 – 1215	***Grid Code & Compliance*** *UAE & GCCIA Grid Code Overview • Frequency & Voltage Limits • Connection Agreements • Black-Start Capabilities*
1215 – 1230	*Break*
1230 – 1330	***Interconnection & Power Exchange*** *GCCIA Regional Grid • Tie-Line Operation & Flow • Power Wheeling & Contracts • Emergency Power Exchange Protocols*
1330 – 1420	***Power Quality Management*** *Harmonics & Flicker • Voltage Sags & Transients • Power Quality Meters • Mitigation Equipment & Methods*
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*

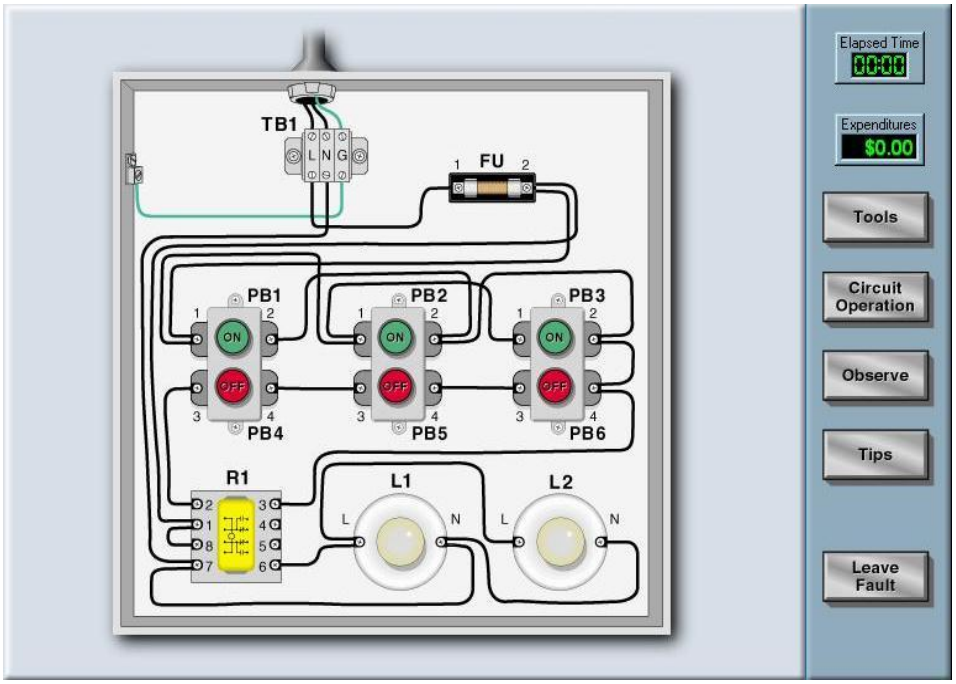
Day 5

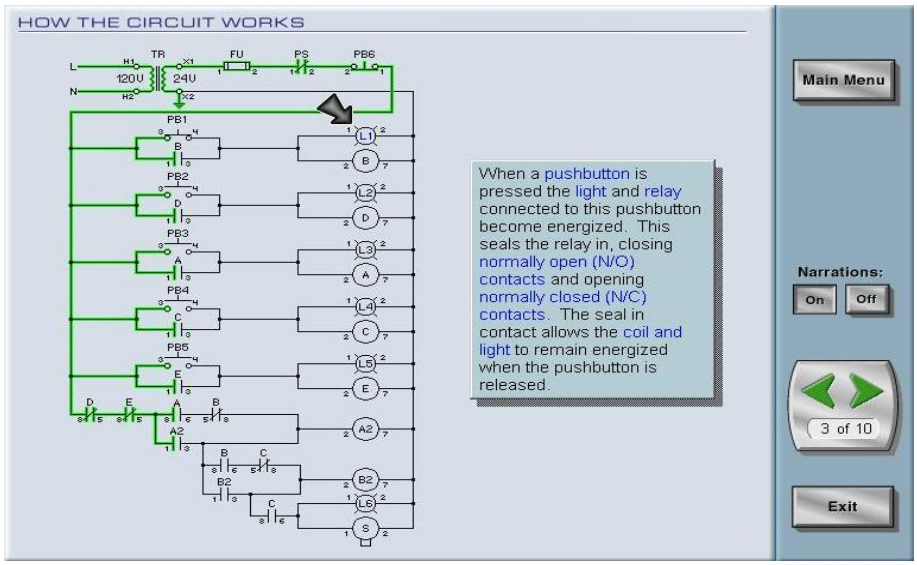
0730 – 0830	***Load Forecasting & Demand Planning*** *Short & Long-Term Forecasting • Load Curve Analysis • Seasonal & Diurnal Variations • Integrated Resource Planning (IRP)*
0830 – 0930	***Transmission System Planning*** *Load Flow & Contingency Analysis • Expansion Planning • Transmission Losses Estimation • Line Routing & Permitting*
0930 – 0945	*Break*
0945 – 1030	***Digitalization in Generation & Transmission*** *Smart Grids & IoT Integration • Predictive Maintenance with AI • Digital Twin Applications • Data Analytics & Decision-Making*
1030 – 1130	***Renewable Integration into Grid*** *Grid Codes for Renewables • Curtailment & Smoothing Techniques • Battery & Hybrid Storage • Advanced Forecasting Tools*

1130 – 1230	***Cybersecurity in Power Systems*** *Threats to SCADA/EMS Systems • Cyber-Physical Risk Management • Standards (NERC CIP, IEC 62443) • Incident Response Planning*
1230 – 1245	*Break*
1245 – 1345	***Case Studies & Group Exercises*** *UAE Generation-Transmission Integration • Desalination-Powered Grid Modeling • Fault Analysis Simulation • Final Q&A & Course Wrap-Up*
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 "Simutech Troubleshooting Electrical Circuits V4.1".





Simutech Troubleshooting Electrical Circuits V4.1

Course Coordinator

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