COURSE OVERVIEW EE1161
Electrical Engineering & Supervision

Electrical Systems, Transformers & Other Electrical Assets: Design, Installation, Faults, Inspection, Testing, Maintenance, Troubleshooting, ATEX & Electrical Safety

Course Title

Electrical Engineering & Supervision: *Electrical Systems, Transformers & Other Electrical Assets: Design, Installation, Faults, Inspection, Testing, Maintenance, Troubleshooting, ATEX & Electrical Safety*

Course Date/Venue

September 21-25, 2025/Meeting Plus TBA, City Centre Rotana, Doha, Qatar

Course Reference

EE1161

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.

This course is designed to provide participants with a detailed and up-to-date overview of Electrical Engineering & Supervision. It covers the concepts of electrical engineering including voltage, current, resistance and power; the circuit analysis techniques, node-voltage and mesh-current methods for circuit analysis; the Thevenin's and Norton's theorems for simplifying complex circuits; the alternating current (AC) and sinusoidal waveforms; analyzing AC circuits using phasors and complex numbers; and the impedance and admittance concepts for circuit analysis and power calculations in AC circuits.

Further, this course will also discuss the IECC/IEEE standards, power generation, transmission and distribution systems; the power systems components, power factor correction, reactive power compensation, generating units and substations; the OSHA electrical safety procedures and national electrical code; the pre-commissioning and installation testing, transformer and switchgear testing; and the power quality and harmonics analysis.

During this interactive course, participants will learn the fault finding and troubleshooting, maintenance scheduling and techniques and testing equipment and safety precautions; the power transformer failure and faults, power transformer protection, transformer operation and factory acceptance test (FAT); the electric motor testing techniques and generator testing and monitoring; the protection relay testing and calibration, primary injection testing of protection circuits; and the battery and DC system testing and control panel and wiring check.

Course Objectives

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

- Apply and gain an in-depth knowledge on electrical engineering and supervision
- Discuss the concepts of electrical engineering including voltage, current, resistance and power
- Apply circuit analysis techniques, node-voltage and mesh-current methods for circuit analysis
- Review Thevenin's and Norton's theorems for simplifying complex circuits
- Discuss alternating current (AC) and sinusoidal waveforms as well as analyze AC circuits using phasors and complex numbers
- Explain impedance and admittance concepts for circuit analysis and power calculations in AC circuits
- Recognize IECC/IEEE standards, power generation, transmission and distribution systems including power systems components, power factor correction, reactive power compensation, generating units and substations
- Carryout OSHA electrical safety procedures and discuss the national electrical code
- Explain pre-commissioning and installation testing, transformer and switchgear testing and power quality and harmonics analysis
- Carryout fault finding and troubleshooting, maintenance scheduling and techniques and testing equipment and safety precautions
- Recognize power transformer failure and faults as well as employ power transformer protection, transformer operation and factory acceptance test (FAT)
- Apply electric motor testing techniques and generator testing and monitoring
- Carryout protection relay testing and calibration, primary injection testing of protection circuits, battery and DC system testing and control panel and wiring check

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 a basic overview of all significant aspects and considerations of electrical engineering and supervision for electrical engineers, maintenance engineers and technicians, testing and commissioning engineers, asset integrity and reliability engineers, substation and switchgear operators, utility and power plant engineers, electrical safety officers, inspection and compliance officers 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

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 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 **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise includes 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.

Accommodation

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

Course Fee

US$ 6,000 per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Program

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

Day 1: ***Sunday, 21st of September 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Electrical Engineering – Refresh of Electrical Concepts*** *Electrical Engineering and its Applications • Fundamental Concepts: Voltage, Current, Resistance, and Power • Circuit Analysis Techniques: Ohm's Law, Kirchhoff's Laws, and Voltage/Current Division • Node-voltage and Mesh-Current Methods for Circuit Analysis • Thevenin's and Norton's Theorems for Simplifying Complex Circuits*
0930 – 0945	*Break*
0945 – 1100	***AC Circuits*** *Alternating Current (AC) and Sinusoidal Waveforms • Analysis of AC Circuits using Phasors and Complex Numbers • Impedance and Admittance Concepts for Circuit Analysis • Power Calculations in AC Circuits: Real Power, Reactive Power, and Apparent Power*
1100 – 1215	***Power Systems*** *IECC/IEEE Standards - Power Generation, Transmission, and Distribution Systems • Power System Components: Generators, Transformers, Transmission Lines and Distribution Networks*
1215 – 1230	*Break*
1230 – 1420	***Power Systems (cont'd)*** *Power Factor Correction and Reactive Power Compensation • Structure of the Electrical Power System • Generating Units - Synchronous Generators, Exciters and Automatic Voltage Regulators, Turbines and their Governing Systems • Substations - Types of Modifications*
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: ***Monday, 22nd of September 2025***

0730 – 0900	***OSHA Electrical Safety Procedures*** *Energy Control • Lockout/Tagout Procedures • Using Power Tools Safely*
0900 – 0915	*Break*
0915 – 1115	***OSHA Electrical Safety Procedures (cont'd)*** *Work Clothes • Personal Protective Equipment • Electrical Tools: Voltage Testers etc.*

1115 -1230	***The National Electrical Code*** *Overview of the NEC • Wiring & Protection • Wiring Methods & Materials • Equipment for General Use • Special Occupancies • Special Equipment • Special Conditions • Communications System • Equipment Grounding • Circuit Grounding*
1230 – 1245	*Break*
1245 – 1420	***The National Electrical Code (cont'd)*** *Protection Against Ground Faults • Transformer Grounding • Effects of Impedance • Grounding Through Enclosures • Visual Indication of Ground for Ungrounded Circuits • Grounded Conductor Alarms • Detecting Faults Automatically • Static Electricity*
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: Tuesday, 23rd of September 2025

0730 – 0830	***Pre-Commissioning & Installation Testing*** *Visual Inspections and Installation Checks • Megger (IR) Testing for Cables and Motors • Continuity and Polarity Testing • Earth Loop Impedance and RCD Trip Testing*
0830 – 0930	***Transformer & Switchgear Testing*** *Transformer Ratio and Insulation Resistance Tests • CT Polarity and Burden Testing • Breaker Insulation and Contact Resistance • Functional Testing of Interlocks and Relays*
0930 – 0945	*Break*
0945 – 1100	***Power Quality & Harmonics Analysis*** *Voltage Fluctuation, Sag/Swell, Harmonics • THD and Waveform Distortion • Effects on Sensitive Equipment • Solutions: Filters, Reactors, Phase Balancing*
1100 – 1215	***Fault Finding & Troubleshooting*** *Systematic Fault Diagnosis Steps • Use of Multimeters, Clamp Meters, Thermal Cameras • Common Electrical Faults (Nuisance Tripping, Loose Contacts) • Root Cause Analysis and Reporting*
1215 – 1230	*Break*
1230 – 1330	***Maintenance Scheduling & Techniques*** *Preventive, Predictive, and Condition-Based Maintenance • Maintenance Checklists for Panels, Motors, Cables • Thermography and Vibration Analysis • Reliability-Centered Maintenance (RCM) Basics*
1330 – 1420	***Testing Equipment & Safety Precautions*** *Using Insulation Testers and Earth Testers • Safety Around High Voltage Testing • Ground Fault and Loop Testers • Equipment Calibration and Standard Adherence*
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 4: Wednesday, 24th of September 2025

0730 – 0930	***Power Transformer Failure & Faults*** *Causes of Failure • Oil & Insulation Faults • Windings Faults • Overloads & Overheating • Assessing Risk Failure • Preparing a Risk Based Transformer Management Program*
0930 – 0945	*Break*
0945 – 1100	***Power Transformer Protection*** *Built-on Protections Differential Protection • Overcurrent Protection • Restricted Earth Fault Protection • Overload Protection*
1100 – 1230	***Transformer Operation*** *Inrush Currents & Harmonics • Parallel of Transformers • Power Factor • Lightning & Switching Overvoltages • Surge Arresters • Fire Protection*
1230 – 1245	*Break*
1245 - 1420	***Factory Acceptance Tests (FAT)*** *Type Tests • Routine Tests • Special Tests • Oil Testing*
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 5: Thursday, 25th of September 2025

0730 – 0830	***Electric Motor Testing Techniques*** *Insulation Resistance and Polarization Index • Surge Comparison and Winding Resistance Tests • Rotor Bar, Bearing and Core Testing • Offline versus Online Motor Diagnostics*
0830 – 0930	***Generator Testing & Monitoring*** *Stator and Rotor Winding Testing • Excitation System Diagnostics • Synchronization Checks • Thermal Monitoring and Trending*
0930 – 0945	*Break*
0945 – 1030	***Protection Relay Testing & Calibration*** *Functional Testing of Protective Relays • Secondary Injection Testing • Relay Coordination and Settings Validation • Testing Distance, Overcurrent and Differential Relays*
1030 – 1130	***Primary Injection Testing of Protection Circuits*** *Purpose and Procedure of Primary Injection • CT and Breaker Coordination Checks • Verifying Trip Curves and Response Time • Current Injection Setup and Interpretation*
1130 – 1230	***Battery & DC System Testing*** *Battery Impedance Testing • Discharge and Capacity Tests • Float Voltage and Specific Gravity • UPS Systems Inspection and Alarms*
1230 – 1245	*Break*
1245 – 1345	***Control Panel & Wiring Check*** *Continuity and Point-to-Point Testing • Terminal Torque and Connection Checks • Functionality of Control Circuits • Signal Testing and Verification*
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*

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-

Course Coordinator

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