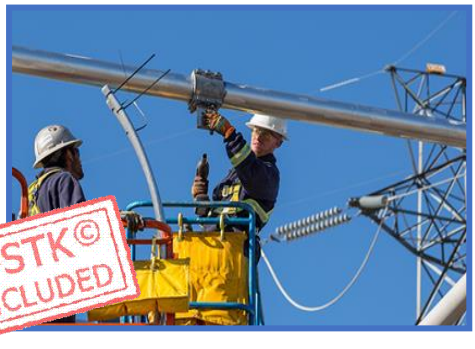
COURSE OVERVIEW EE0050S3
High and Medium Voltage Substation Design, Testing and Maintenance

Course Title
High and Medium Voltage Substation Design, Testing and Maintenance



Course Reference
EE0050S3

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

Course Date/Venue

Session(s)	Date	Venue
1	May 12-16, 2024	Oryx Meeting Room, Doubletree By Hilton Doha-Al Sadd, Doha, Qatar
2	November 17-21, 2024	The Kooh Al Noor Meeting Room, The H Dubai Hotel, Sheikh Zayed Rd - Trade Centre, Dubai, UAE
3	February 09-13, 2025	Kizkulesi, Crown Plaza Istanbul Asia Hotels & Convention Center, Istanbul, Turkey

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.

The electric power substation, whether generating station or transmission and distribution, remains one of the most challenging and exciting fields of electric power engineering. Recent technological developments have had tremendous impact on all aspects of substation design, operation, maintenance, safety, and grounding, testing and troubleshooting. A substation is a high – voltage electric system facility. It is used to switch generators, equipment, and circuits or lines in and out of a system.

This course is designed to provide participants with a detailed and up-to-date overview of high and medium voltage substation design, testing and maintenance. It covers the various types of substations, substation parts and equipment and major components; the overcurrent protection for phase and earth faults and recommended grading intervals; the relay connection, earth fault protection and overcurrent protection for relay connections, residual voltage and sensitive wattmetric protection; and the transformers function and substation earthing systems.

During this interactive course, participants will learn the reasons for substation earthing system and substation earthing calculation; the substation layout and electrical drawings; the main and circuit of the schematic diagram; the racking and routing, installation detail and panel layout; the other electrical documents, standardization of symbols and schematics exercises; and the qualifications of testing organizational and personnel.

Course Objectives

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

- Apply and gain an in-depth knowledge on high and medium voltage substation design, testing and maintenance
- Identify the various types of substations, substation parts and equipment and major components
- Employ overcurrent protection for phase and earth faults and recommended grading intervals
- Carryout relay connection, earth fault protection and overcurrent protection for relay connections, residual voltage and sensitive wattmetric protection
- Recognize transformers function and substation earthing systems
- Discuss the reasons for substation earthing system and calculate substation earthing
- Analyze the substation layout and interpret electrical drawings
- Illustrate the main and circuit of the schematic diagram
- Identify racking and routing, installation detail and panel layout
- Recognize other electrical documents, standardization of symbols and schematics exercises
- Discuss the qualifications of testing organizational and personnel

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 high and medium voltage substation design, testing and maintenance for industrial, utility or plant engineers, maintenance supervisors, consulting engineers, electric utility 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

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.

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. Ahmed Abozeid is a **Senior Electrical Engineer** with over **25 years** of **Onshore** & **Offshore** experience within the **Oil** & **Gas, Refinery**, **Petrochemical** and **Power** industries. His wide expertise covers **HV Cable** Design, **Cable** Splicing & Termination, **Cable** Jointing Techniques, **High Voltage** Electrical Safety, **HV/MV Cable Splicing**, **High Voltage Circuit Breaker** Inspection & Repair, **High Voltage Power System** Safe Operation, High Voltage Safety, **High Voltage Transformers**, Safe Operation of **High Voltage & Low Voltage Power Systems**, **Electric Distribution System Equipment**, Practical Troubleshooting of **Electrical Equipment & Control Circuits**, **Electrical & Control System** Testing & Commissioning, **LV/MV/HV Circuit Breakers** Inspection & Maintenance, Electrical **Power Substation** Maintenance, Practical **High Voltage Safety Operating Procedures**, Modern Power System **Protective Relaying**, **Electrical & Control System** Testing, **Design**, **Commissioning**, **Operation** and **Maintenance** of **Switchgears**, **Transformers**, **Substations**, **Medium & High Voltage Equipment** and **Circuit Breakers**, **Electrical Motors & Variable Speed Drives**, **Motor** Speed Control, Power Electronic Converters, AC Converters Section, Electromagnetic Compatibility (**EMC**), **Motor** Failure Analysis & Testing, **Machinery** Fault Diagnosis, **Bearing** Failure Analysis **Process Control & Instrumentation**, **Process Control Measurements**, **Control System Commissioning & Start-Up**, **Control System & Monitoring**, **Power Station Control System**, **Instrumentation Devices**, **Process Control & Automation**, **PID Controller**, Distributed Control Systems (**DCS**), Programmable Logic Controllers (**PLC**), **ABB PLC & DCS System**, **Gas Analyzers**, **Simulation Testing**, **Load Flow**, **Short Circuit**, **Smart Grid**, **Vibration Sensors**, **Cable Installation & Commissioning**, **Calibration Commissioning** and **Site Filter Controller**. Further, he is also well-versed in **Fundamentals of Electricity**, **Electrical Standards**, **Electrical Power**, **PLC**, **Electrical Wiring**, Machines, **Transformers**, **Motors**, **Power Stations**, **Electro-Mechanical Systems**, **Automation & Control Systems**, **Voltage Distribution**, **Power Distribution**, **Filters**, **Automation System**, **Electrical Variable Speed Drives**, **Power Systems**, **Power Generation**, **Power Transformers**, **Diesel Generators**, **Power Stations**, **Uninterruptible Power Systems** (**UPS**), **Battery Chargers** and **AC** & **DC Transmission**. He is currently the **Project Manager** wherein he manages, plans and implements projects across different lines of business.

Mr. Ahmed worked as the **Electrical Manager**, **Assistant General Technical Manager**, **Electronics & Instruments Head**, **Electrical Power & Machine Expert**, **Electrical Process Leader**, **Team Leader**, **Electrical Team Leader**, **Electronics & Instruments Maintenance Superintendent**, **Engineering Supervisor**, **Technical Instructor** and **Instructor/Trainer** from various companies such as the Lafarge Nigeria, Egyptian Cement Company, ECC Training Center, Alrajhi Construction & Building Company and Ameria Cement Company, just to name a few.

Mr. Ahmed has a **Bachelor's** degree in **Electrical Engineering**. Further, he is a **Certified Instructor/Trainer** and has delivered numerous trainings, seminars, courses, workshops and conferences internationally.

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

Doha	**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.
Dubai	**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.
Istanbul	**US$ 6,000** per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), 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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Types of Substations***
0930 – 0945	*Break*
0945 – 1100	***Substations Parts & Equipment***
1100 – 1230	***Major Components***
1230 – 1245	*Break*
1245 – 1330	***Overcurrent Protection for Phase & Earth Faults***
1330 - 1420	***Recommended Grading Intervals***
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 - 0930	***Relay Connections***
0930 – 0945	*Break*
0945 – 1100	***Earth Fault Protection***
1100 – 1230	***Overcurrent Protection (Relay Connections, Residual Voltage, Sensitive Wattmetric Protection)***
1230 – 1245	*Break*

1245 – 1330	***Transformers Function***
1330 - 1420	***Substation Earthing Systems***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Reasons for Substation Earthing System***
0930 - 0945	*Break*
0945 - 1100	***Substation Earthing Calculation***
1100 – 1230	***The Layout of the Substation***
1230 – 1245	*Break*
1245 – 1420	***Understanding Electrical Drawings***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***The Schematic Diagram (Main & Circuit)***
0930 – 0945	*Break*
0945 – 1100	***Racking & Routing***
1100 – 1230	***Installation Detail***
1230 – 1245	*Break*
1245 – 1420	***Panel Layout***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Other Electrical Documents***
0930 – 0945	*Break*
0945 – 1100	***Standardization of Symbols***
1100 – 1230	***Schematics Exercises***
1230 – 1245	*Break*
1245 – 1345	***Qualifications of Testing Organizational & Personnel***
1345 – 1400	***Course Conclusion***
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

Jaryl Castillo, Tel: +974 4423 1327, Email: jaryl@haward.org