COURSE OVERVIEW EE0060
LV, MV and HV Circuit Breakers

Course Title
LV, MV and HV Circuit Breakers

Course Date/Venue
September 21-25, 2025/Meeting Plus 9, City Centre Rotana, Doha, Qatar

3.0 CEUs (30 PDHs) AWARD

Course Reference
EE0060

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 update participants with the latest development of Circuit Breakers and to present some of the more common and updated aspects of low, medium and high voltage switchgear maintenance. It must be understood that there is an incredible variety of equipment used on low, medium and high voltage switchgear today. Switchgears play an important role in the protection, distribution and control of electrical power in manufacturing or power plant and in a utility distribution system. Negligent maintenance practices can lead to power system inefficiency and loss of system reliability

An older plant may have switchgear that was built in the forties in the older areas and modern switchgear in other areas as the plant was upgraded. This course will present maintenance problems to the maintenance manager and technician. Newer plants will probably have modern equipment of a limited variety and manufacture. It is these similarities that will be covered in the course.

Course Objectives

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

- Specify, design, operate, inspect, test, maintain, repair and troubleshoot circuit breakers and switchgears
- Apply an in-depth knowledge and skills on LV/MV/HV circuit breakers and switchgears
- Describe the switchgear details such as ratings, degree of protection, service conditions and ancillary equipment
- Explain switchgear asset management including CBM and RCM process, tripping devices, maintenance and testing
- Apply load and fault calculation to decide the task of protection system and the operating conditions of power system
- Explain circuit breaker control circuits, types and application of protective relays, structure of control circuits and the use and application of current and voltage transformers
- Discuss circuit breaker characteristics in relation to protection control circuits, selectivity, sensitivity and speed of the control circuits
- Recognize the value of earthing system to protection control circuits and the power system protection as well as fault clearance and power system redundancy through control system application
- Identify the various switchgear diagnostic techniques and employ the different types of substation circuit breaker techniques and determine the switchgear vital equipments including batteries condition and monitoring, relay applications for basic and complex busbar arrangements and zone selection logic
- Employ the substation maintenance techniques and discuss their description, structures, features and functions
- Apply the switchgear maintenance practices and improve maintenance and repair procedures
- Carryout maintenance work orders including their process development, procedures and problems encountered
- Introduce computerized maintenance management systems (CMMS) and recognize its importance in circuit breakers design, inspection, maintenance, repair and troubleshooting

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 Circuit Breakers and Switchgears for engineers and other technical staff who need a sound understanding of Low, Medium and High Voltage Switchgear and Circuit Breaker specification, design, operation, inspection, testing, maintenance, repair and troubleshooting.

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.

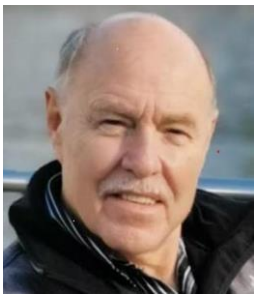
Haward Technology Middle East will award 3.0 CEUs (Continuing Education Units) or 30 PDHs (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation 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.

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. Fred Du Plessis is a **Senior Electrical Engineer** with over **30** years of extensive experience within the **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise widely covers in the areas of **Thermal Gas Power Generation**, **Power Station** Operations, **Power Generation Plant Outage** Management, **Power System** Analysis, **Power System** Generation & Distribution, **Electric Power System** Design, **Renewable Energy**, **Energy Storage** Technologies, Maintenance, Testing & Troubleshooting, **Transformer Protection**, **Transformer** Problem and Failure Investigations, **Power System Operation and Control**, Fault Analysis in **Power Systems**, **HV/MV Cable Splicing**, **High Voltage Electrical Safety**, **High Voltage Circuit Breaker** Inspection & Repair, **High Voltage Power** System, **HV Equipment** Inspection & Maintenance, **HV Switchgear** Operation & Maintenance, Resin / **Heat Shrink & Cold Shrink** Joints, **HV/LV Equipment**, ORHVS for Responsible and Authorized Person **High Voltage Regulation**, **Transformers** Maintenance, inspections & repairs, Commissioning of **LV & HV Equipment**, Oil Purification and **High Voltage Maintenance**, HT Switch Gear - Testing, Safe Operating, Maintenance, Inspection & Repairs on **LV & HT Cables** - Testing (Pulse & Megger), Line Patrol in **Low Voltage & Distribution**, **Transmission**, **Operating Principles up to 132KV**, Abnormal Conditions & Exceptions, Commissioning & Testing, **Transformer Inspections & Repairs**, **Live Line Work up to 33KV**, **Basic Power System Protection**, **High Voltage** Operating Preparedness Phasing (**110V to 132KV**), **HV Operating & Fault** Finding (up to 132KV), Maintenance & Construction Supervision, **VSD/VFD** Installations & Testing, **Electrical Panel Design**, **VSD/VFD Installations & Testing**, Instrument Installation and wiring, **AC/DC Supplies & Change Over Systems**, **AC & DC Winders** and VLF Testing, **Gas Turbines**, **Steam Turbine** with a **Station Generation**, **Project** Management & Project Controls, **Water Treatment & Reverse Osmosis** Plant Management and **Mechanical Maintenance** Management.

During Mr. Du Plessis's career life, he has gained his practical experience through several significant positions and dedication as the **Project Manager/Owner**, **Maintenance Manager**, **Project Excecution Manager**, **Commissioning & Operating Manager**, **Acting Operating Manager**, **Optimization/Commissioning Manager**, **Operating Support Manager**, **Operating Production/Shift Manager**, **Operations Lead Engineer**, **Electrical Engineer**, **Production/Maintenance Planner**, **Unit Shift Supervisor**, Principal **Plant Operator**, **Workshop & Maintenace Consultant**, Assistant **Electrical Supervisor**, Trainee **Motor Mechanic** and **Senior Instructor/Trainer** from various international **power station** companies like the Dunamis Energy, Peterhead Power Station, Lijaco Services, Eskom, Matla Power Station, Grootvlei Power Station, Ellisras Brick & Ceramic, Hlalisanani Mechanical Contractor, Matimba Power Station, Matimba Power Station, Eskom Kriel Power Station and Transvaal Provincial.

Mr. Du Plessis has a **Bachelor's** (with Honours) degree in **Operations Management**. Further, he holds certification in Red & Silver Seal Accreditation Power Generation – (ESETA), a SAMTRAC & NOSA **Auditor** – (NOSA), a **Certified Instructor/Trainer** and has further delivered various trainings, seminars, conferences, workshops and courses globally.

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

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*** *Voltage Convention • Fundamentals of Circuit Breakers • Types of Breakers, Construction • Ratings, Tripping Characteristics*
0930 – 0945	*Break*
1020 – 1120	***Switchgear in a Network Context*** *Single Line • Utilization*
1120 – 1220	***Switchgear in Historical Perspective*** *Oil Circuit Breakers • Air Blast CB • SF6 and Vacuum CB • Operating Mechanisms*
1230 – 1245	*Break*
1245 – 1420	***Switchgear Details*** *Ratings Ur, Ik, Ip, Va • Degree of Protection • Service Conditions • Ancillary Equipment*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: Monday, 22nd of September 2025

0730 – 0930	***Switchgear Asset Management*** *Equipment Register • CBM and RCM Process • Switchgear Diagnostic Techniques • Tripping Devices & Maintenance & Testing*
0930 – 0945	*Break*
0945 – 1130	***Circuit Breakers Control Circuits*** *Philosophy, Types & Application of Protective Relays • Control System Structure, Instrument Transformers • Current & Voltage Transformers • Panels, Signalling, Interlocking*

1130– 1230	***Circuit Breakers Control Circuits (cont'd)*** *Typical Connection Diagrams • Primary & Back-up Relaying • Fault Calculation • System Earthing • Circuit Breakers Characteristics • Selectivity, Sensitivity, Speed • Reliability*
1230 – 1245	*Break*
1245 – 1420	***Circuit Breakers Control Circuits (cont'd)*** *Evaluation of Protection Relaying • Setting of Protection • Fault Clearance • Redundant Control Circuits*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3: Tuesday, 23rd of September 2025

0930 – 1015	***Case Study*** *Circuit Breaker Settings • Selectivity, Sensitivity, Speed*
0930 – 0945	*Break*
0945 – 1130	***Circuit Breaker Diagnostic Techniques*** *Diagnostic Techniques*
1130 – 1230	***Switchgear Vital Equipments*** *Batteries Condition and Monitoring • Discussions*
1230 – 1245	*Break*
1245 – 1420	***LV/MV/HV Substation Bus Arrangement, Incoming & Outgoing Circuits*** *Automatic Switching During Normal or Abnormal Conditions, Bus Protection & Circuit Breaker System • Bus Differential & Breaker Failure Relay, Zone Selection Logic & CT Requirements*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4: Wednesday, 24ht of September 2025

0730 – 0930	***Substation Maintenance Techniques*** *Description • Structures • Fuses, Arresters, Switches • Substation Compound • Switchgear Maintenance Practices • Metal Clad Switchgear • Maintenance Details*
0930 – 0945	*Break*
0945 – 1130	***Substation Maintenance Techniques (cont'd)*** *Metal Clad Switchgear Maintenance Details • Discussions*
1130 – 1230	***Substation Maintenance Techniques (cont'd)*** *Maintenance & Repair Fundamentals*
1230 – 1245	*Break*
1245 – 1420	***Substation Maintenance Techniques (cont'd)*** *Maintenance & Repair Procedures*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

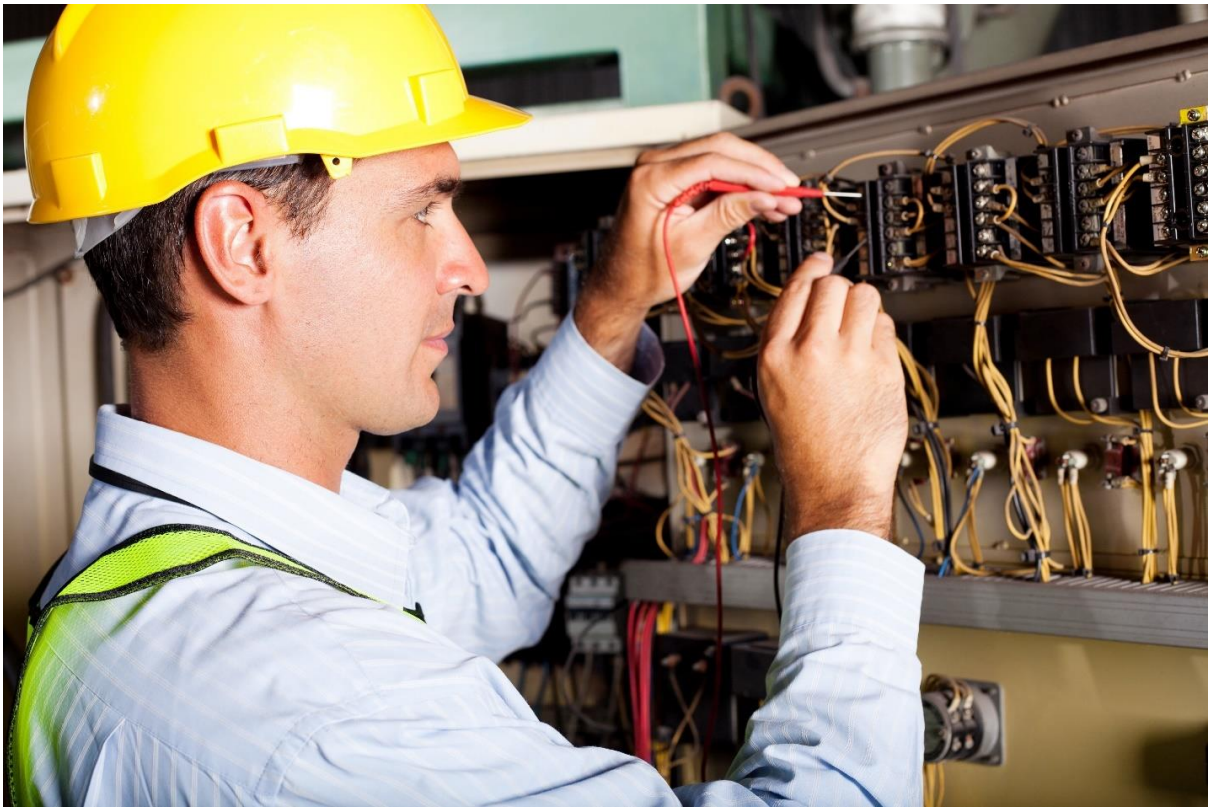
Day 5: Thursday, 25th of September 2025

0730 – 0930	***Maintenance Work Orders*** *Process Development*
0930 – 0945	*Break*
0945 – 1100	***Maintenance Work Orders (cont'd)*** *Procedures*

1100 – 1200	***Maintenance Work Orders (cont'd)*** *Problems Encounters • Samples, Discussions*
1200 – 1215	*Break*
1215 – 1345	***Fundamentals of Computerized Maintenance (CMMS)***
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

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