COURSE OVERVIEW EE0800
Function and Setting of Generator

H-STK© INCLUDED

3.0 CEUs (30 PDHs) AWARD

Course Title
Function and Setting of Generator

Course Date/Venue
Session 1: June 23-27, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: December 07-11, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
EE0800

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 for those who have a need to understand most aspects of power plant GENERATORS.

The course addresses Theory of Generator Operation, Design Considerations, Construction, Relationships to the System, Excitation Systems, Auxiliaries, Normal/Abnormal Operations, Protective Relaying associated with the Generator, Outage Planning, Disassembly, Inspection/Repair, and Reassembly.

There are NO SMALL PROBLEMS when it comes to the GENERATOR!! The Design, Construction, Operations, Safety, Testing, Inspection/Repair as well as disassembly/reassembly shall be fully understood. Register for this course today and get the answers to the all questions including:

- How does a generator function?
- Why is it designed as it is?
- What happens if the generator is synchronized out-of-phase?
- What happened in the control room such that one would make such a large error when synchronizing?

- How can we avoid such an error?
- Just how bad (and what is) negative phase sequence currents?
- Corona discharge what does that mean?
- How do you repair fused stator punchings?
- What components should be high-potential tested?
- How can we avoid accidental injury when testing the generator?
- What are the probable causes of grounded fields?
- Why have we (recently) heard of hydrogen explosions? How do we avoid?
- And the list of answered questions goes on!!!

Course Objectives

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

- Apply systematic techniques in operation, maintenance, control, testing and troubleshooting of power generators
- Determine how a generator functions and how an active and reactive power is generated and how these loads are shared from one generator to another
- Identify the major components used in the construction of an AC generator and discuss how these components are at risk during mis- or abnormal operations
- Explain operation and maintenance of the most common excitation systems and how a speed governor alters generator output in response to a frequency deviation
- Discuss how the voltage regulator alters generator output in response to a voltage deviation
- Identify the causes and effects of both voltage and frequency oscillations and the impact on power system dynamics
- Describe generator normal/safe startup and shutdown procedures and generator synchronizing process
- Discuss abnormal generator operation, recommend actions for generator protection during an unfortunate abnormal condition and describe possible results to equipment and/or system
- Describe the major activities associated with generator maintenance, proper generator disassembly and reassembly sequences, procedures for cleaning generator components, procedures for inspection of generator components and describe the different types and causes of damage
- Identify the various repair methods for defective component condition and list all those electrical tests commonly performed on large AC generators
- Describe the procedures for the various generator tests and describe safety precautions for the conducting of these electrical tests

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 generator for those who are involved in the operation, maintenance, control, testing and troubleshooting of power plant generators including electrical, plant maintenance, utility, mechanical and control engineers and other technical staff.

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$ 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 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 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. Amar Namoune, PE, BSc, is a **Senior Electrical Engineer** with over **20 years** of extensive experience within **Oil**, **Gas**, **Petrochemical** and **Power** industries. His expertise widely covers **Transformer Maintenance & Testing**, **Electrical Substation & Design**, **Power Quality** Studies & Load Criteria, LV/MV Electrical Safety (**11 KV, 415 & 220 Voltage**), **Substation Earthing System**, Emergency **Diesel Generator**, **Electrical Safety**, **Power System Equipment**, **Electrical Drawing**, **Electrical Forecasting**, **Transmission Networks**, **Substation**, **Cable & Over Head Line**, **Distribution Networks**, **Substation Automation Systems & Application**, **Electrical Control & Monitoring System**, **Protection & Control of Electric Power System**, **Power System Control**, Communication for **Power System Automation**, **Communication Technologies**, **Substation Architectures**, **Specification & Engineering**, **System Maintenance** of **Substation Automation & Control Systems**, **Power System Information Integration & Automation**, **Power System Standardization**, System Configuration Language (**SCL**), Electrical Distribution System & Single Line Diagram (**SLD**), IEC 61850-6 Engineering Process, **Power Generation**, Generators, Emergency Diesel Generators (**EDG**), **Electrical Power** Systems, Electric Submersible Pumps (**ESP**), **High Voltage Electrical Safety**, **HV Overhead Power Line** Construction & Patrolling, **Power Transmission & Distribution**, **Electrical Distribution** Systems, **Electrical Power Systems** Quality & Troubleshooting, **Protection & Relay**, **Electric & Control** System Commissioning, Practical Troubleshooting & Repair of **Electronic Circuits**, Fault Analysis in **Electrical Networks & Distribution Cables**, **Variable Frequency Drives** (VFD), **Motor Operation and Maintenance**, **Electric Motor** Protection, Testing & Maintenance, **Motors & Variable Speed Drives**, **UPS System & Battery Charger**, **Circuit Breakers & Switchgears**, **HV/LV** Switching and Isolation, HV/MV **Cable** Splicing, Jointing & Termination, Uninterruptible Power Supply (**UPS**), Supervisory Control and Data Acquisition (**SCADA**) Systems, **Introduction to SCADA**, **Distributed Control System and SCADA** Systems, **ABB SCADA**, **Advanced PLC & SCADA** Systems, AC/DC & Batteries, **GIS Substation** Maintenance, **Generator** Maintenance & Troubleshooting, **Diesel Generator** Troubleshooting, **Substation** Automation Systems & Application (IEC 61850), **Transformers** Troubleshooting & Maintenance, **Earthing**, **Bonding**, **Lightning & Surge** Protection, **Process Control & Automation**, **Compressor** Control & Protection, Practical **Industrial Data Communications & Telecommunications**, **Safety Instrumented Functions**, Explosion Protection Type of Electrical Equipment & Systems, Electricity & Wiring Fundamentals, **Fire & Gas** Detection System, **Hazardous Area Classification & Intrinsic Safety** (IEC 60079, ATEX 95/137 & API RP 500/505), **Electrical Drawings & Schematic Layouts**, HSEIA, COMAH, HAZOP, HAZID, MAXIMO, Ex Equipment, Selection, Inspection & Maintenance and Installation, Testing and Commissioning of Electrical Equipment. Currently, Mr. Amar is the **Senior Electrical Instructor & Assessor** wherein he is responsible in providing guidance and training gap analysis on safe electrical and substation automation system maintenance, methodology, installation, testing, certification and operation of electrical and substation automation equipment, plant and systems.

Mr. Amar gained his expertise and thorough practical experience through several positions as an **Electrical Instructor & Assessor**, **Electrical Instructor & Assessor**, **Technical Department Associate Manager**, **Maintenance Section Head** for various companies such as the PETROFAC & PDO, Oman, ADNOC Gas Processing, IFFCO Group and BENAMOR Mills wherein, he assists in the development of **safety systems experts** to ensure strict compliance with **OSHA regulations** and specifications, codes and standards (IEC & IEEE, NFPA 70E, Shell DEP); oversees the **development** and **implementation** of **operations/process improvement** to include planning, staging and execution; spearheads the organization to a strict compliance with the **Health and Safety processes & standards** and leads in the **development** and **implementation** of an **active safety culture**, integrating a daily behaviour-based process throughout the organization.

Mr. Amar has a **Bachelor's** degree in **Electrical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and an **IOSH** Managing Safely Certified and delivered numerous trainings, courses, seminars and workshops worldwide.s

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 and Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Generator Theory*** *Armature Reaction ● Resistive Loads ● Inductive Loads ● Capacitive Loads ● Power Transfer and Load Angle ● Reactive Power ● Net Air Gap ● Developed Torque ● Watt and VAR Control ● Generator Capability ● Stator Winding Heating ● Field Heating ● Core End Iron Heating ● Power System ● Power Transfer Between Generator Rotor and Stator ● Short Circuit Ratio*
0930 – 0945	*Break*
0945 – 1100	***Generator Theory (Lite)*** *Fundamentals of Generator Design ● Review of AC Power ● Armature Reaction ● Development of Torque ● Net Air Gap Magnetic Fields ● Effects of VARs on Current ● Effect of VARs on Voltage ● Active and Reactive Power Flow ● Generators Operating Under Load ● Changing MW load ● Changing MVAR load*
1100 – 1230	***System Operations*** *Structure of the Power System ● Interconnections ● Power Balance*
1230 – 1245	*Break*
1245 – 1420	***System Operations (cont'd)*** *Operation of the System ● State of the Power System*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Generator Construction*** *Stator Frame ● Core, Windings ● End Shield ● Rotor Body ● Field Windings ● Retaining Rings ● Collector Rings ● Hydroelectric Differences*
0930 – 0945	*Break*
0945 – 1100	***Excitation Systems, Voltage & Frequency Control*** *Speed Governor Response to Frequency Deviations ● Automatic Voltage Regulator Response to Voltage Deviations ● Manual Regulator ● URAL ● Impedance Compensator ● Volts/Hertz ● Maximum Excitation Limit ● Transfer & Tracking ● PSS ● De-Excitation*
1100 – 1230	***Excitation Systems, Voltage & Frequency Control (cont'd)*** *Steady State Operation ● Transient Conditions ● Earlier Excitation Systems ● Rotating AC Exciters ● Alterrex ● Brushless Excitation Systems ● Static Excitation Systems*

1230 – 1245	*Break*
1245 – 1420	***Generator Auxiliary Systems*** *Purpose and Operations of the Generator Hydrogen Control System ● Generator Seal Oil System ● Stator Liquid Cooling System (as required)*
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 – 0930	***Normal Operations*** *Preparation for Start-Up ● Synchronizing ● Load Changes ● Use of Reactive Capability Curve ● Shut-down*
0930 – 0945	*Break*
0945 – 1100	***Abnormal Operations: Relationships Between Operations, Protection and Alarms; Alarms, Protection when Off-Line, Tripping Methods, Protective Actions for Generator Faults and Abnormal Operations & Protection Recommendations*** *System Steady & Dynamic Conditions ● Frequency Deviations ● Voltage Deviations ● Instabilities ● Loss of Synchronism ● Stator Overcurrent ● Field Ground ● Stator Ground Fault ● Stator Phase-to-Phase Fault*
1100 – 1230	***Abnormal Operations: Relationships Between Operations, Protection and Alarms; Alarms, Protection when Off-Line, Tripping Methods, Protective Actions for Generator Faults and Abnormal Operations & Protection Recommendations: (cont'd)*** *Over Voltage ● Over Volts-per-Hertz ● Field Overheating ● Loss of Excitation ● Bearing Vibration ● Synchronizing Errors ● Motoring ● Seal Oil System Pressure*
1230– 1245	*Break*
1345 – 1420	***Abnormal Operations: Relationships Between Operations, Protection and Alarms; Alarms, Protection when Off-Line, Tripping Methods, Protective Actions for Generator Faults and Abnormal Operations & Protection Recommendations (cont'd)*** *Stator Coolant System ● Local Overheating ● Unbalanced Armature Currents ● Breaker Failures ● System Back Up ● Voltage Surges ● Transmission Line Planned Switching ● High Speed Reclosing ● Accidental Energization*
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 – 0930	***Outage Planning & Scheduling*** *Why Maintenance ● Preparation ● Tooling ● Documentation ● Pre-Shutdown Maintenance ● Decision Making*
0930 - 0945	*Break*
0945 - 1100	***Generator Mechanical Maintenance Activities*** *Why Generators Fail ● Special Tools ● Spare Parts ● Safety Precautions ● Disassembly/Reassembly Procedure ● Cleaning and Checklists*
1100 - 1230	***Stator Visual Inspection*** *Loose Slot Wedges ● Discoloration ● Loose Punchings ● Bar Vibration ● Girth Cracks ● Corona*
1230 - 1245	*Break*
1245- 1420	***Stator Visual Inspection (cont'd)*** *Loose/Broken Ties ● Liquid Connections ● Air Baffles ● Oil Deflectors ● Hydrogen Seals*
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	***Rotor Visual Inspection*** *Collector Rings ● Rotor Journal Surface ● Terminal Studs ● Hydrogen Seal Areas ● Axial Flow Fans ● End Turns ● Field Slot Wedges ● Retaining Rings*
0830 - 0930	***Purpose of Generator Electrical Tests*** *Safety Considerations*
0930 - 0945	*Break*
0945 - 1130	***STATOR*** *Winding Resistance ● Insulation Resistance ● Dielectric Absorption ● Direct Current Leakage ● Dissipation Factor Test ● Radio Noise (Corona) ● High Potential Test ● Ring Test*
1130 - 1230	***ROTOR*** *Resistance Test ● PI ● Impedance Testing ● Flux Pattern Test*
1230 - 1245	*Break*
1245 - 1345	***ROTOR (cont'd)*** *Pole Drop ● High Potential Testing ● Air Gap Flux Probe Testing*
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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