COURSE OVERVIEW EE0439
OHTL Maintenance Practices

Course Title
OHTL Maintenance Practices

Course Date/Venue
August 25-29, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

3.0 CEUs (30 PDHs) AWARD

Course Reference
EE0439

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

H-STK© INCLUDED

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 an up-to-date overview of intensive overhead transmission line (OHTL). It covers the power transmission networks, components of transmission lines, reliability levels and selection of economic voltage of transmission of power; the OHTL safety procedures; the OHTL towers; the OHTL conductors; the isolator materials; the surge arrestors and the OHTL earthing.

Further, the course will also discuss the function of current transformer including its types, classes, connections, multi-ratio, polarity, burden calculations, saturation, etc.; the OHTL voltage transformers; the OHTL outdoor circuit breakers and reclosers; the OHTL measurements and instrumentation; and the distribution switchgear of oil wells.

During this interactive course, participants will learn to maintain, repair and troubleshoot switchgears and VSD; recognize variable speed drive and electronic components that include diode, thyristor, transistor and IGBT; and identify the design, function and equivalent circuit diagram of motors as well as the design and function of AC converter.

Course Objectives

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

- Apply and gain an in-depth knowledge on intensive overhead transmission line (OHTL)
- Describe power transmission networks, components of transmission lines, reliability levels and selection of economic voltage of transmission of power
- Employ OHTL safety procedures and discuss OHTL towers covering its types, selection of tower structure, tower design, spacing and clearances and clearance for power line crossings
- Recognize OHTL conductors including the types of conductors, selection of conductor size, spacing between conductors, offset of conductors, sag and tension calculations, electrical requirements, vibration dumpers, jumpers and corona calculations
- Identify the isolator materials and isolator types, causes of isolator failures, voltage distribution over isolators, arcing horns, string efficiency, methods to improve string efficiency and guard rings
- Describe surge arrestors including lightning and flashovers, operation principle of surge arresters, gapless type surge arresters, external gap type surge arresters and surge arrestors monitoring
- Explain OHTL earthing including earthwire selection criteria, tower earthing methods and standards, protective angle, back flashover, counterpoise methods and earth resistance measuring methods
- Discuss the function of current transformer as well as its construction types, classes, connections, multi-ratio, polarity, burden calculations, saturation, etc.
- Recognize OHTL voltage transformers and the function of voltage transformers, inductive, capacitive VTs, coupling capacitors, medium voltage outdoor VTs, VTs for GIS, combined transformers, VT standard accuracy classes and burdens
- Analyze OHTL outdoor circuit breakers and reclosers covering the function of a CB, IEEE standards for selection of CBs, requirements of CBs, classification of CBs, oil CBs, vacuum CBs, air blast CBs, etc.
- Carryout OHTL measurements and instrumentation and describe the distribution switchgear of oil wells
- Maintain, repair and troubleshoot switchgears in a professional manner
- Define variable speed drive and discuss electronic components including diode, thyristor, transistor and IGBT
- Explain VSD of oil wells as well as the design, function and equivalent circuit diagram of motors
- Identify the design and function of AC converter covering rectifier, DC link, inverter, pulse width modulation, pulse-edge and space-vector modulation
- Maintain, repair and troubleshoot VSD efficiently

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 is course provides an overview of all significant aspects and considerations of overhead transmission line for engineers and other technical staff.

Course Certificate(s)

(1) Internationally recognized Competency Certificates and Plastic Wallet Card Certificates will be issued to participants who have successfully completed the course and passed the exam at the end of the course. Certificates are valid for 5 years.

Recertification is FOC for a Lifetime.

Sample of Certificates

The following are samples of the certificates that will be awarded to course participants:-

(2) Official Transcript of Records will be provided to the successful delegates with the equivalent number of ANSI/IACET accredited Continuing Education Units (CEUs) earned during the course.

Haward Technology Middle East
Continuing Professional Development (HTME-CPD)

Page 1 of 1

CEU Official Transcript of Records

TOR Issuance Date: 28-Apr-17

HTME No. PAR11317

Participant Name: Eissa Al Dossari

Program Ref.	Program Title	Program Date	No. of Contact Hours	CEU's
EE439	**Intensive Overhead Transmission Line (OHTL)**	April 24-28, 2017	30	3.0

Total No. of CEU's Earned as of TOR Issuance Date **3.0**

TRUE COPY

Maricel De Guzman
Academic Director

Haward Technology has been approved as an Authorized Provider by the International Association for Continuing Education and Training (IACET), 1760 Old Meadow Road, Suite 500, McLean, VA 22102, USA. In obtaining this approval, Haward Technology has demonstrated that it complies with the ANSI/IACET 1-2013 Standard which is widely recognized as the standard of good practice internationally. As a result of their Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for programs that qualify under the ANSI/IACET 1-2013 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 Association 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 is accredited by

P.O. Box 26070, Abu Dhabi, United Arab Emirates | Tel.: +971 2 3091 714 | Fax: +971 2 3091 716 | E-mail: info@haward.org | Website: www.haward.org

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 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.

Course Instructor(s)

This course will be conducted by the following instructors. However, we have the right to change the course instructor 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 **Circuit Breaker**, **HV Switchgear Maintenance**, **HV/LV Electrical** Authorisation, Basic **Electricity**, **Electrical & Special Hazards**, **Intensive Overhead Transmission Line** Maintenance, **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** and **Bachelor** 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.

Accommodation

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

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 course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Monday, 25th of August 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to OHTLs*** *Power Transmission Networks • Components of Transmission Lines • Reliability Levels • Selection of Economic Voltage of Transmission of Power*
0930 – 0945	*Break*
0945 – 1100	***OHTL Safety Procedures*** *Main Causes Lead to an Accident • Electrical Fire Hazards • Hazard Identification • Injury Prevention Techniques • OSHA's and ANSI's Preventive Measures • Risk Assessment Checklist • Emergency Procedures Following Contact with Overhead Power Lines*
1100 - 1230	***OHTL Towers*** *Types of Towers • Selection of Tower Structure • Tower Design • Spacing and Clearances • Clearance for Power Line Crossings*
1230 – 1245	*Break*
1245 - 1420	***OHTL Conductors*** *Types of Conductors • Selection of Conductor Size • Spacing Between Conductors • Offset of Conductors • Sag and Tension Calculations • Electrical Requirements • Vibration Dampers • Jumpers • Corona Calculations*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: ***Tuesday, 26th of August 2025***

0730 – 0930	***OHTL Isolators*** *Isolator Materials • Isolator Types • Causes of Isolator Failures • Voltage Distribution Over Isolators • Arcing Horns • String Efficiency • Methods To Improve String Efficiency • Guard Rings • String Efficiency Calculation Examples*
0930 – 0945	*Break*

0945 – 1100	***OHTL Surge Arrestors*** *Lightning Hits and Flashovers • Operation Principle of Surge Arresters • Gapless Type Surge Arresters • External Gap Type Surge Arresters • Monitors for Surge Arrestors*
1100 - 1230	***OHTL Earthing*** *Reasons for Earthing OHTLs • Earthwire Selection Criteria • Tower Earthing Methods • Tower Earthing Standards • Protective Angle • Back Flashover • Counterpoise Methods • Earth Resistance Measuring Methods*
1230 - 1245	*Break*
1245 – 1420	***OHTL Current Transformers*** *What is the Function of CT? • Construction Types of CTs • CT Classes • CT Connections • Multi-ratio CTs • CT Polarity • CT Burden Calculations • CT Saturation • CT Calculations • CT Standards • Power Transformers' CT Connections • Substation Circuit Breakers' CT's • Generators' CT Connections • Optical CTs*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3: Wednesday, 27th of August 2025

0730 – 0930	***OHTL Voltage Transformers*** *What is the Function of VT? • Inductive VTs • Capacitive VTs • Coupling Capacitors • Medium Voltage Outdoor VTs • VTs for GIS • Combined Transformers • VT Standard Accuracy Classes and Burdens*
0930 – 0945	*Break*
0945 – 1100	***OHTL Outdoor Circuit Breakers & Reclosers*** *What is the Function of a CB? • IEEE Standards for Selection of CBs • Requirements of CBs • Classification of CBs • Oil CBs • Vacuum CBs • Air Blast CBs • SF6 CBs • Controls of CBs • Automatic Reclosing • Reclosure Selection • IEEE Standards for Recloser Selection*
1100 – 1230	***OHTL Measurements & Instrumentation*** *Phase Continuity Test • Measurement of Overhead Conductor Sag • Insulation Resistance Test • Earth Current Injection Test • Structure Earth Resistance Test*
1230 - 1245	*Break*
1245 – 1420	***Distribution Switchgear of Oil Wells*** *General Construction, Operation & Safety • Metal Clad Switchgear Construction & Safety Features • Commissioning Switchgear • Breaker Construction & Safety Features • Capacitors • Current Transformers • Instrument Transformers, Test Switches, Metering and Relaying Devices • NETA Recommended Acceptance Test*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4: Thursday, 28th of August 2025

0730 - 0930	***Maintenance, Repair & Troubleshooting of Switchgears*** *Metal Clad Switchgear Maintenance Details • Discussions • Maintenance & Repair Fundamentals • Maintenance & Repair Procedures • Process Development • Procedures • Problem Solving*
0930 - 0945	*Break*

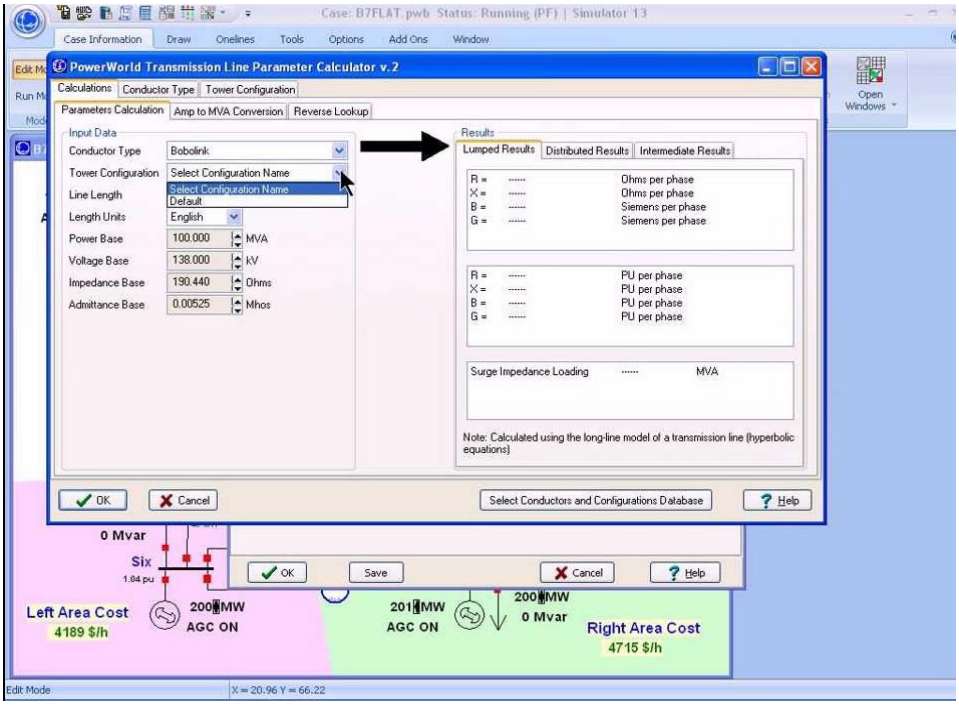
0945 - 1100	***What is a Variable Speed Drive?***
1100 - 1230	***Electronic Components: Diode, Thyristor, Transistor, IGBT*** *Bridge Connection: Behavior on Ohmic and Inductive Load • Rectifier and Inverter Operation • Gating Angle, Commutation, Inverter Commutation Failure*
1230 - 1245	*Break*
1245 - 1420	***VSD of Oil Wells***
1420 - 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5: ***Friday, 29th of August 2025***

0730 – 0930	***Motors: Design, Function & Equivalent Circuit Diagram*** *Speed, Torque and Current Control • V/f Control and Vector Control*
0930 – 0945	*Break*
0945 - 1100	***AC Converter: Design & Function*** *Rectifier, DC Link, Inverter • Pulse Width Modulation, Pulse-edge and Space-Vector Modulation • Motor Limitations*
1100 - 1230	***AC Converter: Design & Function (cont'd)*** *Load Considerations • Acceleration and Braking Requirements*
1230 - 1245	*Break*
1245 - 1300	***Maintenance, Repair & Troubleshooting of VSD***
1300 - 1315	***Course Conclusion***
1315 – 1415	***COMPETENCY EXAM***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulators (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 "PowerWorld Transmission Line Parameter Calculator" simulator.



PowerWorld Transmission Line Parameter Calculator Simulator

Course Coordinator

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org