

COURSE OVERVIEW EE0653
Lightening Protection

Course Title

Lightening Protection

Course Date/Venue

Session 1: April 27-May 01, 2025/Boardroom
 1, Elite Byblos Hotel Al Barsha,
 Sheikh Zayed Road, Dubai, UAE

Session 2: December 08-12, 2025/Fujairah
 Meeting Room, Grand Millennium
 Al Wahda Hotel, Abu Dhabi, UAE

Course Reference

EE0653

Course Duration/Credits

Five days/3.0 CEUs/30 PDHs

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 up-to-date overview of power system harmonics and power quality with earthing and lightning protection. It covers the harmonics, power quality and demand for clean power; the harmonic distortion sources in industrial power systems; the voltage disturbances; the harmonics effects, common symptoms and the negative consequences; the equipment earthing, power quality and lighting protection; and the power transformers, surge arrestors, capacitors, meters and protective relays.



During this interactive course, participants will learn the harmonic reduction, mitigation and attenuation options; the general passive and active filter design procedures; the harmonics and power quality assessment, measurements and standards; the usage of corrective actions and design solutions; the reactive energy compensation; the investment analysis for PQ solutions; and the tips, application considerations and design examples.

Course Objectives

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

- Apply and gain an in-depth knowledge on power system harmonics and power quality with earthing and lightning protection
- Distinguish harmonics and power quality and demand for clean power
- Identify the harmonic distortion sources in industrial power systems and explain voltage disturbances
- Discuss the harmonics effects, common symptoms and the negative consequences
- Illustrate equipment earthing, power quality and lightning protection
- Recognize power transformers, surge arrestors, capacitors, meters and protective relays
- Apply harmonic reduction, mitigation and attenuation options
- Practice general passive and active filter design procedures
- Implement harmonics and power quality assessment, measurements and standards
- Use corrective actions and design solutions as well as apply reactive energy compensation
- Carryout investment analysis for PQ solutions and discuss tips, application considerations and design examples

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 power system harmonics and power quality with earthing and lightning protection for electrical, electronics, instrumentation and control engineers, planners and other technical staff involved in power system harmonics and quality.

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 Certificate(s)


Internationally recognized certificates will be issued to all participants of the course completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations:-

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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.

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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.

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. Ahmed Abozeid is a **Senior Electrical & Instrumentation Engineer** with over **30 years** of **Onshore & Offshore** experience within the **Oil & Gas** 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, ABB 11KV Distribution Switchgear, Rotork Operation & Maintenance, Power System Protection and Relaying, Electrical Motors & Variable Speed Drives, Motor Speed Control, Power Electronic Converters, Control Valve, Flowmetering & Custody Transfer, Meters Calibration, Installation & Inspection, Crude Metering & Measurement Systems, Flow Meter Maintenance Troubleshooting, 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, Electrical Power & Machine Expert, Electrical Process Leader, Team Leader, Electrical Team Leader, 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, Certified TQUK Level 3 Vocational Achievement (RQF) Assessor** and has delivered numerous trainings, seminars, courses, workshops and conferences internationally.

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

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|-------------|---|
| 0730 – 0800 | Registration & Coffee |
| 0800 – 0815 | Welcome & Introduction |
| 0815 – 0830 | PRE-TEST |
| 0830 – 0930 | Introduction to Harmonics & Power Quality & Demand for Clean Power Definitions & Concepts • Harmonics Analysis • Mathematical Representation • Important Terminology • Harmonic Distortion • Harmonic Frequencies • Harmonic Distortion Standards |
| 0930 – 0945 | Break |
| 0945 – 1100 | Harmonic Distortion Sources in Industrial Power Systems Non-Linear Loads • Electronic Variable Speed Drives • UPS |
| 1100 – 1230 | Voltage Disturbances Introduction to Unbalance • Predictive Maintenance – The Key to Power Quality • Voltage Dip Mitigation |
| 1230 – 1245 | Break |
| 1245 – 1420 | Voltage Disturbances (cont'd) Standard EN50160 • Voltage Sags in Continuous Processes |
| 1420 – 1430 | Recap |
| 1430 | Lunch & End of Day One |

Day 2

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|-------------|--|
| 0730 – 0930 | Harmonics Effects, Common Symptoms & Negative Consequences Harmonics – Why Worry? • Effects of Harmonics on Electrical Equipment • Effects of Short Circuit Ratio on Harmonics • The Basics of Harmonic Resonance • The Cost of Harmonics & Poor Power Quality • Understanding Compatibility Levels |
| 0930 – 0945 | Break |
| 0945 – 1100 | Harmonics Effects, Common Symptoms & Negative Consequences (cont'd) Interharmonics • Capacitors in Harmonic – Rich Environments • True RMS – The Only True Measurement • Passive Filters • Active Harmonic Conditioners • Neutral Sizing in Harmonic Rich Installations |
| 1100 – 1230 | Equipment Earthing & Power Quality Earthing & EMC • A Systems Approach to Earthing |
| 1230 – 1245 | Break |
| 1245 – 1420 | Equipment Earthing & Power Quality (cont'd) Earthing Systems – Fundamentals of Calculation & Design • Earthing Systems – Basic Constructional Aspects |
| 1420 – 1430 | Recap |
| 1430 | Lunch & End of Day Two |

Day 3

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|-------------|---|
| 0730 – 0830 | Lightning Protection Need for a Lightning Protection System • Which Protection Systems Work and which Don't • Best Location for IT Equipment • Optimum Earthing for Building |
| 0830– 0930 | Lightning Protection (cont'd) Pitfalls of Isolated Earthing • Shielding and Bonding of Electronics and Communications • Optimum Location of Surge Protection Devices |
| 0930 – 0945 | Break |
| 0945 – 1100 | Power Transformers (cont'd) Parallel Operation of Transformers • Accessories • Failure Modes & Detection • Inspections & Tests • Factory Tests • Field Tests • Oil & Gas Analysis |
| 1100 – 1230 | Instrument Transformers Characteristics & Functions • Types & Ratings • Connections • Inspections & Tests • Common Failure Modes & CT/VT Safety |
| 1230 – 1245 | Break |
| 1245 – 1420 | Surge Arrestors Types & Ratings • Inspections & Tests |
| 1420 – 1430 | Recap |
| 1430 | Lunch & End of Day Three |

Day 4

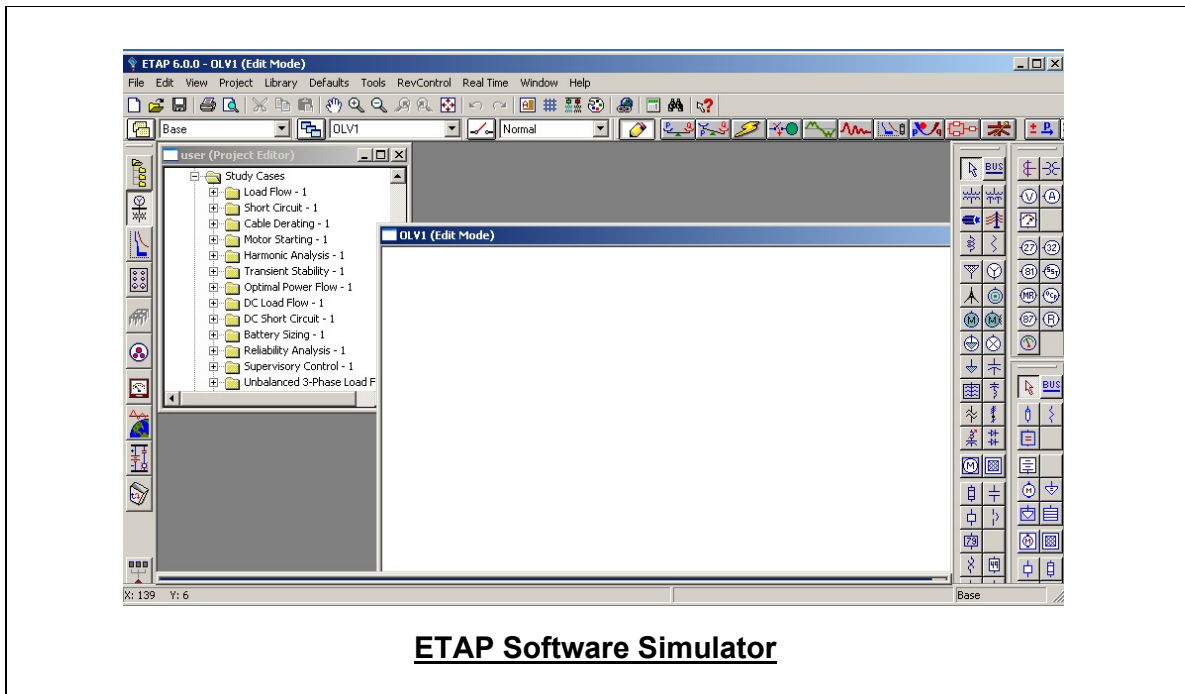
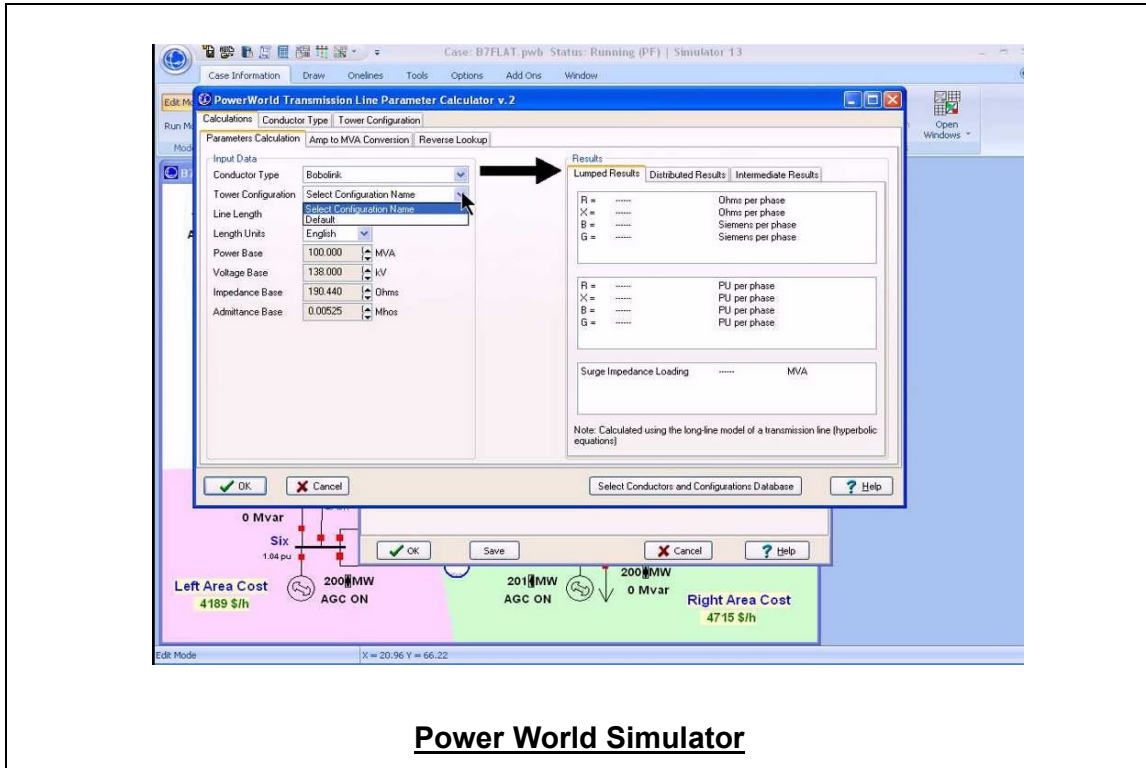
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| 0730 – 0830 | Capacitors Types of Banks & Their Connection • Power Factor Correction • Connection Points • Harmonic Considerations • Inspection & Testing |
| 0830 - 0930 | Meters & Protective Relays Types of Meters & Applications • Types & Application of Protective Relays • Typical Connection Diagrams • Measurement Transducers |
| 0930 – 0945 | Break |
| 0945 – 1100 | Harmonic Reduction, Mitigation & Attenuation Options Chokes (AC Line or DC Link) • Passive Filters • Harmonic Trap |
| 1100 – 1230 | Harmonic Reduction, Mitigation & Attenuation Options (cont'd) Hybrid Filters • High Pulse Count Rectification • Active Filters & Drive Front End |
| 1230 – 1245 | Break |
| 1245 – 1420 | General Passive & Active Filter Design Procedures |
| 1420 – 1430 | Recap |
| 1430 | Lunch & End of Day Four |

Day 5

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|-------------|---|
| 0730 – 0830 | Harmonics & Power Quality Assessment, Measurements & Standards |
| 0830 - 0930 | Corrective Actions & Design Solutions |
| 0930 – 0945 | Break |
| 0945 – 1100 | Reactive Energy Compensation |
| 1100 – 1230 | Investment Analysis for PQ Solutions |
| 1230 – 1245 | Break |
| 1245 – 1345 | Tips, Application Considerations & Design Examples |
| 1345 – 1400 | Course Conclusion |
| 1400 – 1415 | POST-TEST |
| 1415 – 1430 | Presentation of Course Certificates |
| 1430 | Lunch & End of Course |

Simulators (Hands-on Practical Sessions)

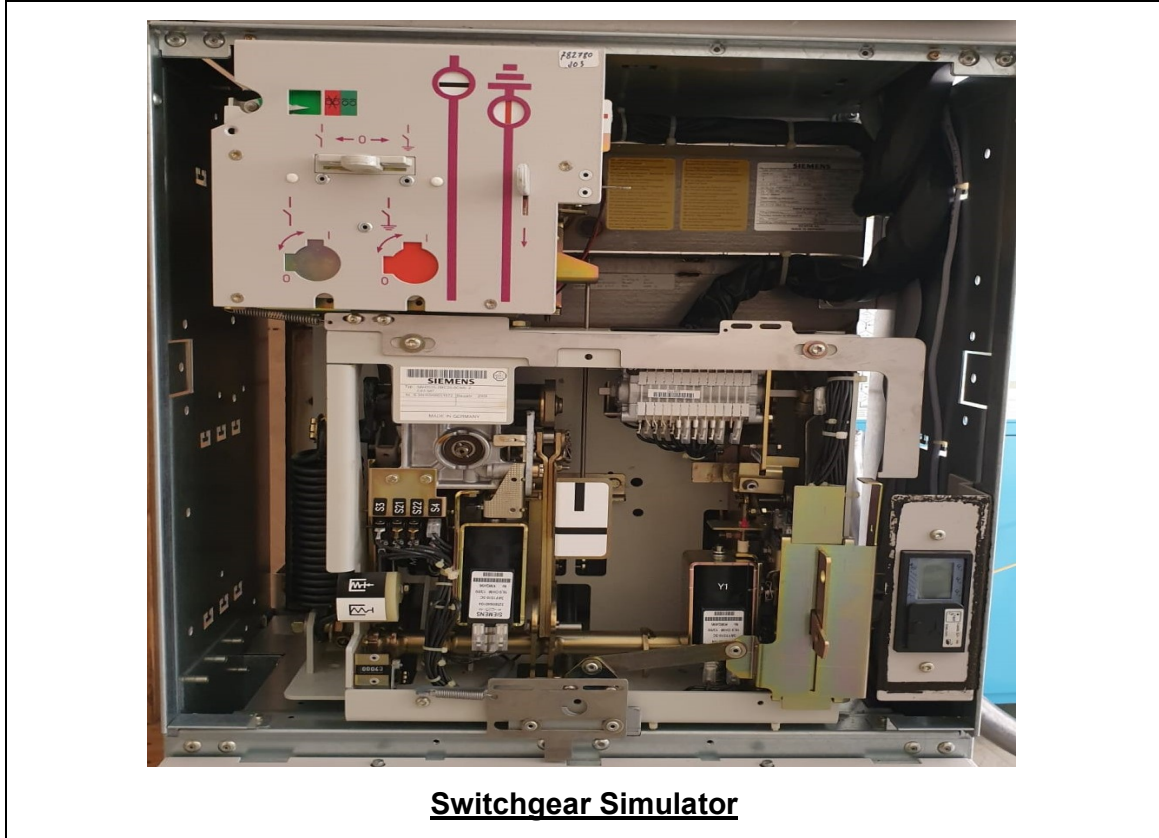
Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators “Power World” and “ETAP software”.











Course Coordinator

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