

COURSE OVERVIEW EE0275 Electrical Protection

Course Title

Electrical Protection

Course Date/Venue

November 17-21, 2024/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference

EE0275

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 delegates with detailed and up-to-date overview of power system protection and relaying. It covers the various faults, their effects and calculations including the effect of faults on equipment; and the earthing system and standard requirement.



The course will also discuss the protection devices and technology including history, construction and principles of protection relays; the IED's and fuses; the instrument transformers, current and voltage transformers as well as types, construction, performance, specification and applications; the tripping devices of circuit breakers; the mechanism of electric arc breakdown; and the principles & calculation of settings for grading and protection coordination.



Overhead lines and feeder protection including the common types of faults and causes; the proper procedure for transformer protection related to restricted Buchholz relay, overpressure, oil and winding temperature; the proper procedure for motor protection; various electrical and mechanical faults; the various generator data requirements; the types of faults, excitation fault protection and mechanical fault protection; the miscellaneous protection including voltage and frequency protections, bus bar protection; and the circuit breaker failure protection will also be discussed during the course.

Course Objectives

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

- Apply and gain systematic techniques in power system protection and relaying
- Identify various faults, their effects and calculations including the effect of faults on equipment
- Recognize earthing system and standard requirement
- Explain protection devices and technology including history, construction and principles of protection relays
- Describe IED's and fuses covering the main protection and back-up protection
- Discuss instrument transformers including current and voltage transformers as well as types, construction, performance, specification and applications
- Review tripping devices of circuit breakers and illustrate the mechanism of electric arc breakdown
- Explain the principles & calculation of settings for grading and protection coordination & cite practical examples
- Analyse overhead lines and feeder protection including the common types of faults and causes
- Implement the proper procedure for transformer protection related to restricted Buchholz relay, overpressure, oil and winding temperature
- Apply the proper procedure for motor protection by analyzing motor data requirements as well as identifying various electrical and mechanical faults
- List the various generator data requirements, types of faults, excitation fault protection and mechanical fault protection
- Identify miscellaneous protection including voltage and frequency protections, bus bar protection and circuit breaker failure protection
- Employ protection relay management and practice simulator

Exclusive Smart Training Kit - H-STK®



Participants of this course will receive the exclusive “Howard 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 a complete and up-to-date overview of the power system protection and relaying for engineers and other technical staff who are involved in the protection and relaying of various power systems, equipment and networks.

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:-

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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.

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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.

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 instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:



Mr. Mike Taylor, PhD, MScLI, MBA, MBL, BSc, HDE, is a **Senior Management Consultant** with over **25 years** of extensive experience in the areas of **Office Management & Effective Administration Skills, Data Quality Control & Assessment, Strategy Management, Project Planning & Scheduling, Facilitation & Leadership Skills, Coaching & Mentoring, Human Resource Development, Psychometric Testing, Talent & Career Development, Learning Needs Identification, Key Performance Indicators (KPIs), Creativity & Thinking, Human Resource Scorecard**

Management, Knowledge Management, Customer Management, Leadership Skills, Presentation Skills, Negotiation Skills, Decision Making Skills, Communication Skills, Emotional Intelligence, Performance Management, Contract Management, Quality Management, Commercial Strategy, Project Management, Risk Management, Leadership & Business Management, Human Resource Management, Business Development, Organization Management & Business Consulting, Stakeholder & Supplier Evaluation, Data Collection & Information Gathering, Value & Supply Chain Management, Intellectual Property & Innovation Assessments, Logistics & Supply Chain Management, Budgeting & Cost Control and Marketing Management. Mr. Taylor is the **Founder & CEO** of Mitakon Innovation Pty Ltd wherein he is responsible for the development of Executives & Senior Managers specializing in innovation, knowledge management and commercial negotiation as well as authored, implemented and executed a global 21st century facilitation and leadership methodology.

During his career life, Mr. Taylor has gained his practical and field experience through his various significant positions and dedication as the **Knowledge-Solutions Service Provider, Founder-Principal/CIO, Subject Matter Expert, Consulting Partner, Executive/Management Development Facilitator, Multinational/Corporate Senior Management Consultant, Senior Quality & Management Consultant, Executive Management Development/Facilitator, Business Consultant/Facilitator, Business & Quality Consultant/Coach, Client Director, Administration Manager, Quality Manager, International Sales & Business Development Executive, Regional Sales Manager, National Key Accounts Manager, Commercial Sales & Marketing Consultant, Admin Assistant, Sales & Marketing Representative, Key Note Speaker, Lecturer and Instructor/Trainer** for various international companies such as the Highland Group (Business Consulting), **Anglo American, BHP Billiton, Rio Tinto, DI Management Solutions (BPO), Master Deal Making Institute (MDMI), RMG/Contact Media & Communications, Paul Dinsdale Properties (PDP), Giant Leap Architects, Wise Capital Investments (HOD), Evolution@ Advertising, Collaborative Xchange, Leatt Corporation, Dentsply SA, FMCG/Binzagr Company, Unilever, Kellogg's, BAT, Hershey's, CORO, Lilly Direct/Lennon Generics and Bausch & Lomb.**

Mr. Taylor has **Master** degrees in **Leadership & Innovation, Business Administration and Business Leadership** as well as a **Bachelor** degree in **Physical Education** and pursuing **PhD in Global Governance & Energy Policy**. Further, he is a **Certified Instructor/Trainer, Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management (ILM)** and a member of Incremental Advantage, Da Vinci Institute, Black Management Forum, Institute of Directors (IOD), World Future Society (WFS), Social Science Research Network, University of Kwazulu Natal (Alumnus), Anthropology & Archaeology Research Network and National Research Foundation (NRF). He has further delivered numerous trainings, courses, workshops, seminars and conferences 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 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 17th of November 2024

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 - 0930	Basic Concepts Introduction to the Topic • Main Electric Parameters & Laws • Standards & Regulations • Standard Voltages
0930 - 0945	Break
0945 – 1100	Faults, Their Effects & Calculations Types of Faults & Causes • Lightning, Switching Overvoltage & Use of Surge Arresters • Safety, Safety Distances & the Dangers of Faults • Short-circuit Faults (Phase & Earth Faults)
1115 - 1230	Faults, Their Effects & Calculations (cont'd) The Effect of Faults on Equipment (Thermal & Electromechanical Stress) • Short-circuit Calculations • Examples & Exercises
1230 - 1245	Break
1245 - 1420	Earthing System & Standard Requirement Solid, Impedance & Ungrounded Systems • The Implications of Various Grounding Techniques on System Performance • Earth Grid & Calculations • Touch & Step Potentials • Examples & Exercises
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 One

Day 2: Monday 18th of November 2024

0730 – 0830	Protection Devices & Technology Introduction to Protection • Simple Protection Devices • Protection Relays (History; Construction & Principles of Operation; Modern Technology) • Classification of Protection Relays & Codes
0830 - 0930	Relays Thermal Overload • Induction Type & Microprocessors Relays • Earth Fault • Over Current • Reverse Power • Field Failure • Shunt Trip, • Earth Leakage Relays

0930 - 0945	<i>Break</i>
0945 - 1045	IED's & Fuses <i>Main Protection & Back-up Protection • Intelligent Electronic Devices (IED's) • Fuses (Characteristics, Applications & Special Cares) • Examples & Exercises</i>
1045 - 1115	Instrument Transformers <i>Current & Voltage Transformers • Types, Construction, Performance, Specification & Applications</i>
1115 - 1200	Instrument Transformers (cont'd) <i>Magnetisation Curve & Characteristics (Ratio, Accuracy & Burden Power) • Testing • Examples</i>
1200 - 1230	Tripping Devices - Circuit Breakers <i>The Mechanism of Electric Arc Breakdown • Types of Circuit Breakers & Applications (LV, MV & HV)</i>
1230 - 1245	<i>Break</i>
1245 - 1420	Tripping Devices - Circuit Breakers (cont'd) <i>Main Characteristics • Operating Mechanism, Tripping Circuits & Control Systems • Examples</i>
1420 - 1430	Recap <i>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</i>
1430	<i>Lunch & End of Day Two</i>

Day 3: Tuesday 19th of November 2024

0730 - 0930	Grading & Protection Co-ordination <i>Principles • Analysis in HV, MV and LV Networks (Transmission & Distribution Networks; Users' Networks) • Calculation of Settings • LV Approach (Typical Time-Current Curves & Selectivity of LV Circuit Breakers) • Practical Examples</i>
0930 - 0945	<i>Break</i>
0945 - 1115	Overhead Lines & Feeder Protection <i>Analysis in HV, MV & LV Networks (Transmission & Distribution Networks) – Common Types of Faults & Causes • Distance Protection (Principle & Application) • Line Differential Protection (Principle & Application) • Overcurrent Protection • Temporary Faults & Auto-Reclosing</i>
1115 - 1200	Overhead Lines Protection (cont'd) <i>Practical Examples</i>
1200 - 1230	Cable Protection <i>Common Types of Faults & Causes • Differential Protection • Overcurrent Protection (Thermal & Short-circuit)</i>
1230 - 1245	<i>Break</i>
1245 - 1420	Transformer Protection <i>Basic Theory of Transformers • Types of Transformers & Applications</i>
1420 - 1430	Recap <i>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</i>
1430	<i>Lunch & End of Day Three</i>

Day 4: Wednesday 20th of November 2024

0730 – 0930	Transformer Protection (cont'd) Main Electric Characteristics & Vector Group • Built-on Protections (Buchholz Relay, Overpressure, Oil & Winding Temperature) • Transformer Differential Protection (Principle & Application) • Overcurrent Protection • Practical Examples
0930 – 0945	Break
0945 - 1130	Motor Protection Motor Data Requirements • Common Types of Faults (Electrical & Mechanical) • Motor Controllers & Starters • Overcurrent (Phase-to Earth & Phase-to-Phase Short-circuit) & Thermal Overload Protection
1130 - 1230	Motor Protection (cont'd) Negative Phase Sequence, Phase Unbalance & Phase Reversal Protections • Bearing Temperature, Winding Temperature, Vibration & Blocked Rotor Protections • Practical Examples & Exercises
1230 - 1245	Break
1245 - 1420	Generator Protection Generator Data Requirements & Basic Theory • Common Types of Faults (Electrical & Mechanical)
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: Thursday 21st of November 2024

0730 – 0830	Generator Protection (cont'd) Rotor & Stator Electric Faults Protection • Excitation Fault Protection • Voltage and Power (Reverse Power) Protections • Over frequency & Overspeed Protections • Mechanical Faults Protection
0830 - 0930	Generator Protection (cont'd) Practical Examples & Exercises
0930 - 0945	Break
0945 - 1100	Miscellaneous Protections Voltage & Frequency Protections • Bus Bar Protection • Circuit Breaker Failure Protection • Testing
1100 - 1230	Miscellaneous Protections (cont'd) Single Phase Distribution Protections • Three Phase Distribution Protections • Circuit Diagrams for Protection Relays • Protection Coordination Curves & Grading • Testing of Relays • Causes of Termination Heating & Preventive Measure • Cause & Effect of Overload, Over Current, Short Circuit & Preventive Measures
1230 – 1245	Break
1245 – 1345	Protection Relay Management & Practice Simulator Scheme Design • SAT & FAT • Commissioning • Maintenance & 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

Simulator (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 “GE Multilin Relay 469” and “GE Multilin Relay 750”.



GE Multilin Relay 469 Simulator

GE Multilin Relay 750 Simulator

Course Coordinator

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