COURSE OVERVIEW EE0189
Electrical System Component

Course Title
Electrical System Component

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

Course Reference
EE0189

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.

Over the past two decades we have seen alarming increases in frequency and severity of electrical system failures. Estimates on the annual costs to industry from power related anomalies have ranged from $30 billion to $200 billion. When an electrical system malfunctions, it is not only expensive to make repairs, but can be a disaster in terms of fire loss as well. Electrical system malfunctions are the leading cause of fire in both industrial and commercial facilities. Electrical losses continue to top the list as the equipment category with the most premature breakdowns, which cost business and industry through extra expense, disruptions and lost profits.

The systematic troubleshooting of electrical distribution systems has been one of the most persistent and difficult problems facing the industry. The performance and characteristics of electrical system configurations are vital factor in reducing or increasing the effect of failure on the system as earthing system, switch gear, protective relays, active and reactive power generation, etc.

The course is designed to provide delegates with detailed and up-to-date overview and practical approach on the troubleshooting of electrical distribution systems and control circuits. It identifies electrical and control symbols; discusses schematics, wiring diagrams, system design and documentation; defines earthing and bonding and explains relay logic circuits.

The course presents methods of electrical troubleshooting and fault analysis, causes, detection and remedies in electrical networks and distribution cables, particularly with the aid of a personal computer and power system simulator. The approach is designed to develop participant's thinking process, enabling them to reach a sound understanding of a broad range of topics related to electrical troubleshooting, while motivating their interest in the electrical power industry. The course includes many case studies describing present day, practical applications. Those case studies and exercises will be solved in the class.

Course Objectives

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

- Apply and gain systematic techniques on troubleshooting of electrical distribution systems and control circuits
- Discuss the concepts in electrical networks and distribution cables covering the main electric parameters and laws, standards, regulations and voltages
- Discuss electrical definitions and acronyms, ground fault system and device evaluations
- Identify the various types of faults, its causes the effects of faults on equipments
- Differentiate symmetrical faults and unsymmetrical faults as well as explain the rules and standards of NETA-ANSI standards and NEC 2011
- Illustrate electrical drawings including relay logic circuit
- Identify the test requirements and apply component testing procedures
- Perform various tests for major components of electrical and control system
- Troubleshoot transformers, generators, switchgears, motors and cables in a professional manner
- Determine system grounding, tripping devices for circuit breakers, protection devices and technology
- Describe instrument transformers and employ grading and protection co-ordination

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 covers systematic techniques of troubleshooting and fault analysis of electrical distribution systems and control circuits for engineers, supervisors and other technical staff who work in transmission, distribution, maintenance, operation, control and analysis of utilities and industrial electrical networks.

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:-

- 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. Ahmed Hayajneh is a **Senior Electrical Engineer** with **20 years** of experience in **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise widely covers in the areas of **HV/MV** Cable Splicing, Jointing, Inspection & Termination, **HV/LV** Equipment, **High Voltage Electrical Safety**, **LV & HV Electrical** System, **HV** Equipment Inspection & Maintenance, **HV Switchgear** Operation & Maintenance, **LV Distribution Switchgear & Equipment**, LV/MV Electrical Safety (**11 KV, 415 & 220 Voltage**), **Power System Equipment**, **Power Cable** Standard and Testing, **Cables & Wiring**, **Overhead Transmission Lines**, **Transmission Network** Maintenance, **Electrical Forecasting** Techniques, **Inspection Reporting** Techniques, **Electrical Substation** Design & Planning, **Electrical Drawings** & **Schematics**, **Fault Detection** Analysis, **Distribution Networks** & **Load Forecasting**, **Power Generation**, **Electrical Power** System, **Electrical** Installations & Utilities, **Electrical Distribution Systems & Control Circuits**, **Electrical Drawings**, **Relay Logic Circuits**, Troubleshooting **Transformers**, **System Grounding**, **Circuit Breakers**, **Protection Devices & Technology**, **Protection Relay**, **Transformers**, **Generators**, **Power Transformers**, **Motors**, **Substations**, **Switchgears & Distribution**, **Power System** Analysis, **Electrical Equipment** Control Systems, **Transformer Maintenance & Testing**, **Electrical Substation & Design**, **Power Quality** Studies & Load Criteria, **Substation Earthing System**, **Electrical Equipment** Maintenance, **Electrical Safety**, **Electrical Protection**, **Batteries**, **Chargers & UPS**, **Electrical Submersible Pumps** (**ESP**), **Power Supply** Substations, Area Classification, Safety Management System, Permit to Work & Issuing Authority, Emergency **Diesel Generator**, **Variable Frequency Drives** (VFD), **PLC & SCADA** for Automation & Process Control, **Automation Solutions & Techniques**, **Automating Process Equipment**, **DCS** Automated Process Control Systems, High & Low Voltage **Electrical Safety**, **Electrical Inspection** & Testing, **Electrical Control** & Monitoring System, **Electric Power System**, Intensive Overhead **Transmission** Line (OHTL), **Generator** Maintenance & Troubleshooting, **Transmission** Line Networks, **Distribution** Engineering, HVDC **Transmission** & Control, **Substation** Maintenance Techniques and **Overhead Power Line** Construction & Patrolling.

Mr. Ahmed gained his expertise and experience through several positions as a **Senior Electrical Project Engineer**, **Senior Electrical Engineer**, **Site Electrical Engineer** and **Senior Instructor/Trainer** for various companies such as United Electro-Mechanical International Company, AL OSAIS Contracting Co., ASTRACO, Saudi Service for Electro Mechanic Work Co. (S.S.E.M), Dubai Electricity & Water Authority (DEWA) and Saudi Electricity Company (SEC).

Mr. Ahmed has a **Bachelor's** degree in **Electrical Engineering**. Further, he is a **Certified Instructor/Trainer** and has 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$ 5,500 per Delegate + **VAT**. The 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 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 & Introduction*
0815 – 0830	***Basic Concepts*** *Introduction to Troubleshooting & Fault Analysis in Electrical Networks & Distribution Cables • Main Electric Parameters & Laws • Standards & Regulations • Standard Voltages*
0830 – 0930	***Electrical Theory*** *Basic Electrical Theory & Commonly Used Formulae • Time-Current Characteristics • Electrical Definitions and Acronyms • Ground Fault Systems • Coordination Studies • Short Circuit Studies • Device Evaluations*
0930 - 0945	*Break*
0945 – 1230	***Faults & Their Effects*** *Types of Faults • Causes of Faults(Internal and External) • High-Impedance Faults • Lightning, Switching Overvoltage and Use of Surge Arresters • Short-circuit Faults (Phase and Earth Faults) • The Effect of Faults On Equipment (Thermal and Electromechanical Stress) • Short-circuit Calculations*
1230 – 1245	*Break*
1245 - 1420	***Symmetrical and Unsymmetrical Faults*** *Series R-L Circuit Transients • System Representation • Sequence Bus Impedance Matrices*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Rules & Standards*** *NETA – ANSI Standards • NETA – Frequency of Tests • ANSI IEC 62337 • NEC 2011*
0930 - 0945	*Break*
0945 – 1100	***Understanding Electrical Drawings*** *IEEE Device Numbers • Drawing Symbols • Single lines Drawings • 3-Line Drawings • AC/DC Trip & Control Schematics • Wiring Diagrams • General System Design, Lay-out and Drawings*
1100 – 1230	***Relay Logic Circuit – 1*** *Timing Relays • Line Ladder Diagrams*
1230 – 1245	*Break*
1245 - 1420	***Relay Logic Circuit – 2*** *Operation of Various Contacting Devices • Operation of Solenoids Relating to Switch Devices*
1420 - 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Test Requirements*** *Development of Test Regime • Outline of Typical Tests • Interpretation of Test Results • Troubleshooting*
0930 - 0945	*Break*
0945 – 1100	***Component Testing Procedures*** *Types of Commonly Used Test Equipment • Insulation Resistance Testing • Contact Resistance Testing • Current Injections, CT Testing • DC Voltage Testing Techniques • AC Voltage Testing Techniques*
1100 – 1230	***Tests for Major Components of Electrical & Control System*** *Testing of Motors and Generators • Variable Frequency Drives (VFDS) • Variable Speed Drives Constant Frequency (VSCF) • Transformers • Switchgear*
1230 – 1245	*Break*
1245 - 1420	***Tests for Major Components of Electrical & Control System (cont'd)*** *Cables and Accessories • Battery System • Protective Relay Systems • Programmable Logic Controllers (PLC) • Distributed Control Systems (DCS)*
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	***Tests for Major Components of Electrical & Control System (cont'd)*** *Electrical Distributed Control System • Power Monitoring • Power Management System • Control Relays/Timers/Switches • Fieldbus*
0930 - 0945	*Break*
0945 – 1100	***Troubleshooting Transformers*** *Types of Transformers • Transformers Parameters • Transformer Connections Fault Profiles • Internal Faults & Protections • Secondary Faults • Primary-to-Secondary Faults*

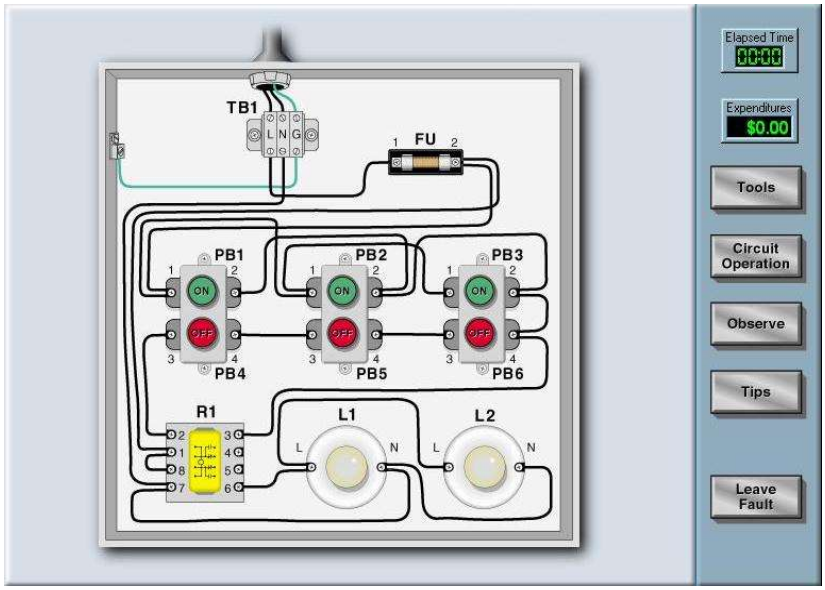
1100 – 1230	***Equipment Troubleshooting*** *Generators ● Switchgears ● Motors ● Overhead Lines ● Underground Cables ● Fault Location*
1230 – 1245	*Break*
1230 - 1420	***System Grounding*** *Solid, Impedance & Ungrounded Systems ● Generation Units ● Power Transformers ● Transmission Lines ● Distribution System ● Arrangement of Grounding in Power System ● Touch & Step Potentials ● Earth Grid & Calculations*
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*

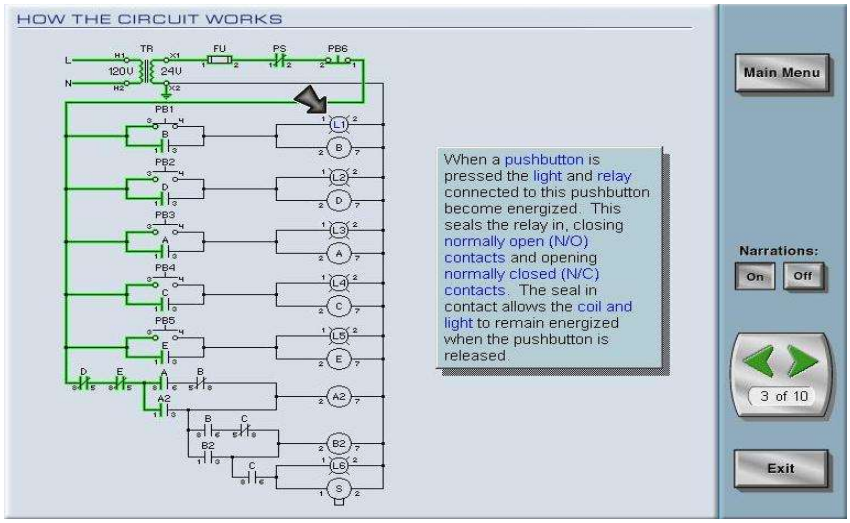
Day 5

0730 – 0930	***Tripping Devices – Circuit Breakers*** *The Mechanism of Electric Arc Breakdown ● Types of Circuit Breakers & Applications (LV, MV & HV) ● Main Characteristics ● Operating Mechanism, Tripping Circuits & Control Systems ● Reclosers*
0930 - 0945	*Break*
0945 – 1100	***Protection Devices & Technology*** *Introduction to Protection ● Protection Relays (History; Construction & Principles of Operation; Modern Technology) ● Classification of Protection Relays & Codes ● Main Protection & Back-up Protection ● Intelligent Electronic Devices (IED's) ● Fuses (Characteristics, Applications & Special Cares) ● Examples & Exercises*
1100 – 1230	***Instrument Transformers*** *Current & Voltage Transformers ● Types, Construction, Performance, Specification & Applications ● Magnetisation Curve & Characteristics (Ratio, Accuracy & Burden Power) ● Testing ● Examples*
1230 – 1245	*Break*
1245 - 1345	***Grading & Protection Co-ordination*** *Principles ● Analysis in HV, MV & LV Networks (Transmission & Distribution Networks; Users' Networks) ● Calculation of Settings ● LV Approach (Typical Time-Current Curves & Selectivity of LV Circuit Breakers) ● Recloser-Recloser Coordination ● Coordinating Instantaneous & Timed Elements ● Practical Examples*
1345 - 1400	***Course Conclusion***
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 simulator "Simutech Troubleshooting Electrical Circuits V4.1".





Simutech Troubleshooting Electrical Circuits V4.1

Course Coordinator

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