COURSE OVERVIEW EE0190(SE2)-4D

Troubleshooting Techniques (Advanced)

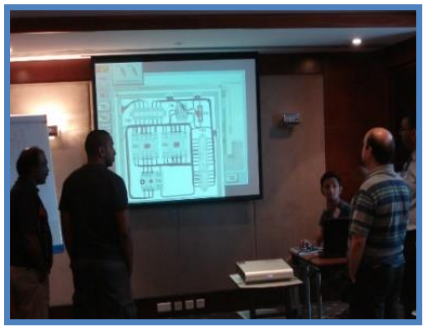
Course Title
Troubleshooting Techniques (Advanced)

Course Date/Venue
October 07-10,2024/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
EE0190(SE2)-4D

Course Duration/Credits
Four days/2.4 CEUs/24 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.

During this interactive course, participants will learn the logical systematic strategy for approaching machine faults and narrowing to the cause, starting with visual symptoms and evidence gathering techniques, essential logical thinking approaches to narrow down a problem area to a specific circuit, navigation of the systems and testing and verification of a fix; which interventions are low risk and which carry the possibility of making things worse (by adding a second fault into the system); which components need a setup routine when changed-out vs. those that are simple plug and play; the electrical schematics to enable cause and effect relationships to be determined and test points to be established; the effective strategies for faults including: open circuits, faulty components pulling down the power supply voltage, faulty coils, machine interlock loop faults, DC & AC short circuits, faulty sensors, sticky contacts, timer faults; the safe work practices for when to work live, de-energized and when and how to isolate, Lock and Tag for maintenance; and communicate effectively to the next shift, document progress on an unresolved fault and vital skill for avoiding repeated steps.

Course Objectives

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

- Apply a logical systematic strategy for approaching machine faults and narrowing to the cause, starting with visual symptoms and evidence gathering techniques, essential logical thinking approaches to narrow down a problem area to a specific circuit, navigation of the systems and testing and verification of a fix
- Evaluate which interventions are low risk and which carry the possibility of making things worse (by adding a second fault into the system)
- Identify which components need a setup routine when changed-out vrs those that are simple plug and play
- Describe electrical schematics to enable cause and effect relationships to be determined and test points to be established
- Apply effective strategies for faults including: open circuits, faulty components pulling down the power supply voltage, faulty coils, machine interlock loop faults, DC & AC short circuits, faulty sensors, sticky contacts, timer faults
- Apply safe work practices for when to work live, de-energized and when and how to isolate, Lock and Tag for maintenance
- Communicate effectively to the next shift, document progress on an unresolved fault and vital skill for avoiding repeated steps

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.

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:-

- 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 **2.4 CEUs** (Continuing Education Units) or **24 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.

- 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.

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 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:

Dr. Ahmed El-Sayed, PhD, MSc, BSc, is a **Senior Electrical & Instrumentation Engineer** with **35 years** of extensive experience within the **Oil**, **Gas**, **Power**, **Petroleum**, **Petrochemical** and **Utilities** industries. His experience widely covers in the areas of Advanced Distributed Control System (**DCS**), **DCS** Operation & Configuration, **DCS** Troubleshooting, **DCS Yokogawa** ProSafe-RS Safety Instrumented System, **DCS Yokogawa** Centum VP, **DCS Emerson** DeltaV, **DCS GE Mark VI**, Programable Logic Controller (**PLC**), Supervisory Control & Data Acquisition (**SCADA**) Systems, **Process Control**, **Control Systems & Data Communications**, **Instrumentation**, **Automation**, **Valve Tuning**, Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**), **Telemetry** Systems, **Boiler Control & Instrumentation**, Advanced Process Control (**APC**) Technology, Practical **Fiber-Optics** Technology, **Compressor** Control & Protection, **GE Gas Turbines**, **Alarm** Management Systems, **Engine** Management System, **Fieldbus** Systems, **NEC** (National Electrical Code), **NESC** (National Electrical Safety Code), **Electrical Safety**, **Electrical Hazards** Assessment, **Electrical Equipment**, Electrical Transient Analysis Program (**ETAP**), Power **Quality**, Power **Network**, Power **Distribution**, **Distribution Systems**, **Power Systems Control**, **Power Systems Security**, Power **Electronics**, **Power System** Harmonics, **Power System** Planning, Control & Stability, **Power Flow** Analysis, **Smart Grid & Renewable** Integration, **Power System Protection & Relaying**, Economic Dispatch & Grid Stability Constraints in Power Plants, Electrical Demand Side Management (DSM), Electrical **Substations**, **Substation Automation** Systems & Application (IEC 61850), **Distribution Network** System Design, **Distribution Network Load**, Electrical **Distribution** Systems, **Load Forecasting** & System Upgrade (Distribution), **Overhead Power Line** Maintenance & Patrolling, High Voltage **Switching** Operations, Industrial **UPS Systems & Battery** Power Supplies, Electric **Motors & Variable Speed Drives**, **Generator** Maintenance & Troubleshooting, **Generator** Excitation Systems & AVR, **Transformer** Maintenance & Testing, Lock-Out & Tag-Out (**LOTO**), Confined Workspaces and **Earthing & Grounding**, He is currently the **Systems Control Manager** of **Siemens** where he is in-charge of Security & Control of Power **Transmission Distribution** & **High Voltage** Systems and he further takes part in the Load Records Evaluation & Transmission Services Pricing.

During his career life, Dr. Ahmed has been actively involved in different Power System Activities including Roles in Power System Planning, Analysis, Engineering, **HV Substation** Design, Electrical Service Pricing, Evaluations & Tariffs, Project Management, Teaching and Consulting. His vast industrial experience was honed greatly when he joined many International and National Companies such as **Siemens**, **Electricity Authority**, Egyptian Electricity Holding, Egyptian Refining Company (ERC), **GASCO**, Tahrir Petrochemicals Project, and **ACETO** industries as the **Instrumentation & Electrical Service Project Manager**, **Energy Management Engineer**, **Department Head**, **Assistant Professor**, **Project Coordinator**, **Project Assistant and Managing Board Member** where he focused more on dealing with Technology Transfer, System Integration Process and Improving Localization. He was further greatly involved in manufacturing some of **Power System** and **Control & Instrumentation Components** such as Series of Digital Protection **Relays**, MV **VFD**, **PLC** and **SCADA** System with intelligent features.

Dr. Ahmed has **PhD**, **Master** & **Bachelor** degrees in **Electrical Engineering** from the **University of Wisconsin Madison**, **USA** and **Ain Shams University**, respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/ Assessor/Trainer** by the **Institute of Leadership and Management** (**ILM**), an active member of IEEE and ISA as well as numerous technical and scientific papers published internationally in the areas of Power Quality, Superconductive Magnetic Energy Storage, SMES role in Power Systems, Power System **Blackout** Analysis, and Intelligent Load Shedding Techniques for preventing Power System Blackouts, HV **Substation Automation** and Power System Stability.

Course Fee

US$ 4,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course 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, 07th of October 2024***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Electrical System Troubleshooting*** *Skills and Qualifications Required to Perform Testing and Troubleshooting • Systematic Approach to Electrical System Troubleshooting • Documentation Required to Perform Troubleshooting*
0930 – 0945	*Break*
0945 – 1030	***Introduction to Electrical System Troubleshooting (cont'd)*** *Electrical System Parameters Trending • Safety Requirements- CSA Z462*
1030 – 1230	***Electrical Safety Requirements During System installation & Equipment Maintenance*** *Construction Site Considerations • Safety During Electrical Testing • Temporary Generators and Construction Power • Personal Protective Equipment Voltage Detection Equipment, Hot-Sticks, Grounds • Temporary Grounds*
1230– 1245	*Break*
1245 – 1420	***Electrical Safety Requirements During System installation & Equipment Maintenance (cont'd)*** *Interlocking • Tagging and Permits • Qualified Electrical Personnel • Roles and Duty of Authorizing Testing Personnel*
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: ***Tuesday, 08th of October 2024***

0730 – 0930	***Testing Procedures*** *DC Voltage Testing Techniques • Insulation Resistance Tests • Step Voltage and High Voltage Tests*
0930 – 0945	*Break*
0910 – 1030	***Testing Procedures (cont'd)*** *Testing Power Factor Correcting Capacitors • AC Voltage Testing Techniques • Power Factor and Dissipation Factor Tests*
1030 – 1230	***Electrical Testing Low Voltage Equipment*** *Generators and Backup Generators • Vibration Monitoring • ATS – Automatic Transfer System • UPS & Battery Systems • VFD –Current and Voltage, Scalar Vector and Direct Torque Control Type • Complex Electromechanical Systems*

1230– 1245	Break
1245 – 1420	***Electrical Testing Low Voltage Equipment (cont'd)*** *AC and DC Motors • PLC and PAC Systems • Robotics and Servo Systems • Industrial Networks • MCC and Motor Generator Group Systems • Motor and Generators Relay Protection • Typical Predictive Maintenance Example for Motors and Drive System*
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: Wednesday, 09th of October 2024

0730 – 0930	***Medium Voltage Equipment Troubleshooting*** *Switchgear Troubleshooting • Medium Voltage Circuit Breakers and Re-Closures: Vacuum; SF6 and Oil Types • Medium Voltage Buss Bars • Medium Voltage Switches • Power Fuses and Supports*
0930 – 0945	*Break*
0910 – 1030	***Medium Voltage Equipment Troubleshooting (cont'd)*** *Power Electronics and Power Factor Correction Systems • Medium Voltage Instrumentation • Switchgear Relay Protection Systems • SCADA, RTU and Bay Controllers • Predictive Maintenance for Switchgear and Medium Voltage Breakers*
1030 – 1230	***Remote Instrumentation & On-Line Monitoring Systems*** *Implementing Transformer Vibration Monitoring System- LAB VIEW • Transformer Oil Monitoring Systems • ETAP Remote Monitoring System for High and Medium Voltage • PI System Parameter Monitoring and Trending • Medium Voltage Motors Monitoring System • Generator Monitoring System Using Rockwell Technology*
1230– 1245	*Break*
1245 – 1420	***Grounding System Maintenance & Testing requirements*** *Testing Requirements of The Grounding Systems • Instrumentation Used for Testing Grounding Systems • Corrective Action Plan to Maintain Grounding Systems Parameters: GPR; Touch and Step Potential • Safety Grounding and Bonding • Avoiding Ground Loop*
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*

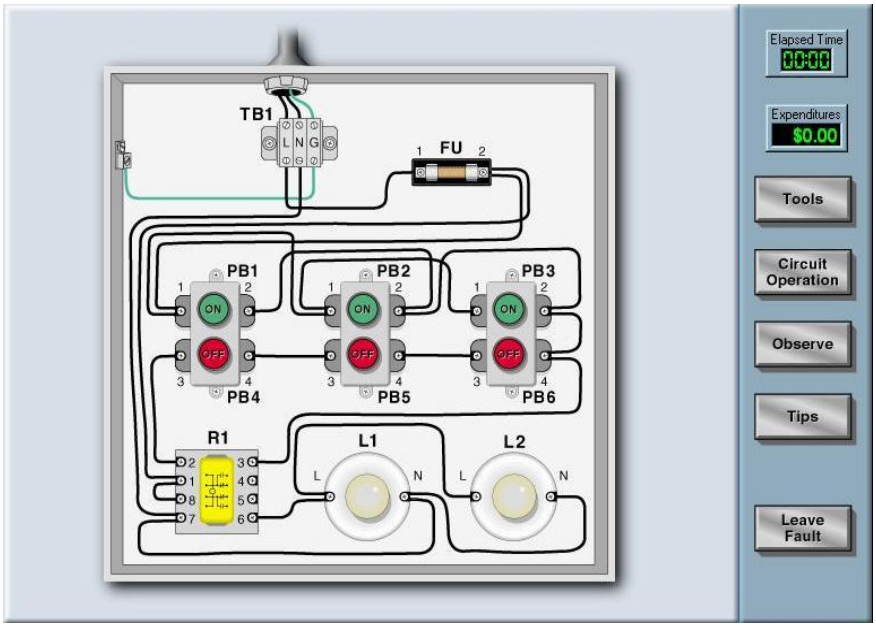
Day 4: Thursday, 10th of October 2024

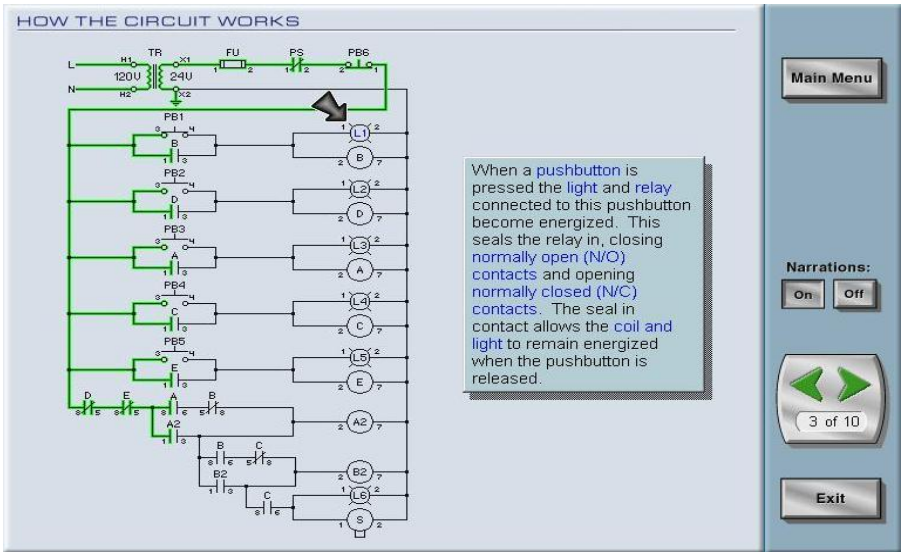
0730 – 0930	***High Voltage Testing & Troubleshooting*** *Switchyards and High-Power Systems • High Voltage SF6 Breakers Troubleshooting • High Voltage Switches • MCOV Testing • Underground and Overhead Transmission Systems*
0930 – 0945	*Break*
0945 – 1030	***High Voltage Testing & Troubleshooting (cont'd)*** *Typical Instrumentation Used For High Voltage Systems • Relay Protection Systems • SCADA Systems, RTU • Predictive Maintenance Requirements For High Voltage Breakers*

1030 – 1230	***Power Transformers Troubleshooting*** *Main Core System • Bushing System • On Load and Off Load Tap Changer • Oil Parameters-DGA • Ventilation and Cooling Systems • Auxiliary Systems and Instrumentation*
1230– 1245	*Break*
1245 - 1345	***Power Transformers Troubleshooting (cont'd)*** *Transformer Relay Protection • Power Transformer Troubleshooting Example • Power Transformer Predictive Maintenance and Life Expectation • The Troubleshooting Method, Demonstrated • Fully Functional, Pre-Wired Leadscrew with Locating Solenoid and Sensors. All Cables Labelled to Match Supporting Schematics, One Kit Per Learner. 15 Faults. • Practice Troubleshooting with Simulations. Simutech Troubleshooting Software Including 3 Phase Reversing Motor Circuit Troubleshooting and Filling and Mixing Tank Process Controlled by a PLC. 20 Faults*
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 simulator "Simutech Troubleshooting Electrical Circuits V4.1".





Simutech Troubleshooting Electrical Circuits V4.1

Course Coordinator

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