

COURSE OVERVIEW EE0901

Operation and Maintenance for MV Switchgear - Eaton

Course Title

Operation and Maintenance for MV Switchgear - Eaton

Course Date/Venue

Session 1: January 26-30, 2025/Al Khobar Meeting Room, Hilton Garden Inn, Al Khobar, KSA
 Session 2: October 26-30, 2025/Al Khobar Meeting Room, Hilton Garden Inn, Al Khobar, KSA



Course Reference

EE0901



Course Duration/Credits

Five days/3.0 CEUs/30 PDHs

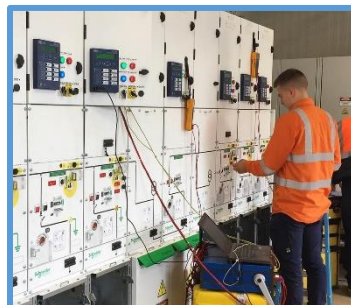
Course Description



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 Operation and Maintenance for MV Switchgear – Eaton. It covers the medium voltage (MV) switchgear covering its applications, components, advantages and role in power distribution; the types of MV switchgear and their configurations; the electrical safety standards and regulations; the personal protective equipment (PPE) for MV operations; the switchgear safety precautions and hazard identification in MV switchgear systems; and the MV circuit breakers, instrument transformers in MV switchgear, protection relays and control system.



Further, the course will also discuss the busbars and conductors, operating mechanisms, interlocks and MV switchgears control and monitoring systems; the preventive maintenance, inspection and cleaning of MV switchgear components and testing MV circuit breakers; the thermal imaging, partial discharge testing, lubrication and mechanical maintenance; the replacing and upgrading components; the proper troubleshooting of MV switchgear failures including fault detection and diagnosis; and the arc flash and fault mitigation techniques, responding to electrical emergencies and restore and recover MV switchgear.

During this interactive course, participants will learn the documentation and reporting for fault events; advanced diagnostics and monitoring technologies; the energy efficiency in MV switchgear operations, upgrades and retrofitting of MV switchgear; the training and competency development for operators; and the best practices for MV switchgear operation and maintenance and ensure adherence to safety protocols.

Course Objectives

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

- Apply and gain an in-depth knowledge on operation and maintenance for MV switchgear
- Discuss medium voltage (MV) switchgear covering its applications, components, advantages and role in power distribution
- Identify the types of MV switchgear and their configurations and explain electrical safety standards and regulations
- Apply personal protective equipment (PPE) for MV operations including switchgear safety precautions and hazard identification in MV switchgear systems
- Identify MV circuit breakers, instrument transformers in MV switchgear, protection relays and control systems
- Recognize busbars and conductors, operating mechanisms, interlocks and MV switchgears control and monitoring systems
- Carryout preventive maintenance, inspection and cleaning of MV switchgear components and testing MV circuit breakers
- Apply thermal imaging, partial discharge testing, lubrication and mechanical maintenance
- Identify replacing and upgrading components and apply proper troubleshooting of MV switchgear failures including fault detection and diagnosis
- Employ arc flash and fault mitigation techniques, respond to electrical emergencies and restore and recover MV switchgear
- Apply proper documentation and reporting for fault events as well as advanced diagnostics and monitoring technologies
- Carryout energy efficiency in MV switchgear operations, upgrades and retrofitting of MV switchgear including training and competency development for operators
- Implement best practices for MV switchgear operation and maintenance and ensure adherence to safety protocols

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 operation and maintenance for MV switchgear for electrical engineers, maintenance engineers and technicians, substation operators, facility managers, field service engineers, electrical safety officers, project managers and other technical staff.

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\$ 7,000 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 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 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. Herman Eksten, PE, PgDiP, is a Senior Electrical Engineer with over 40 years of extensive experience within the Petrochemical, Oil & Gas and Power industries specializing in Circuit Breakers Control Circuits, Circuit Breakers & Switchgears, Switchgear Assets Management, MV Switchgears, Switchgear Life Assessment, Substation Maintenance Techniques, Electrical Safety, Certified HV Electrical Safety, Low Voltage Electrical Safety, Electrical

Circuits: Series and Parallel Connection, Electrical Faults & Protective Devices, Risk Control Methods, LOTO – Breakers Operation in Electricity Substation, LOTO Principles and Procedures, Arc Flash Risk Assessment, Safety in Power Electronic Equipment & Lasers, High Voltage Operation, Electrical Protection, Overhead Lines & Substation, Power Supply, High Voltage Substation, Electrical Protection Design, Earthing & Lightning Protection Design, Underground Equipment, Distribution Network Maintenance & Construction, Transformers Operation & Maintenance, Electric Power System, Power Plant Management, Substation Commissioning & Troubleshooting, Cable Splicing & Termination, Electrical Installation & Maintenance, Power Generation Operation & Control, Structured Cabling, Electric Power System, Power System Stability, Power System Planning & Economics, Power Flow Analysis, Combined Cycle Power Plant, UPS & Battery System, Variable Speed Drives, and HV Motors & Transformers. He is currently the **Lead Electrical Engineer of SNC-LAVALIN** wherein he is responsible for basic designs and successful implementation of electrical engineering to plant overhead lines and substations.

During his career life, Mr. Eksten held various positions such as the **Lead Electrical Engineer, Operations Manager, Project Engineer, Technical Specialist, Customer Executive, District Manager, Electrical Protection Specialist, High-Voltage Operator and Apprentice Electrician** for FOX Consulting, UHDE (ThyssenKrupp Engineering), TWP Projects/Consulting (EPMC-Mining), ISKHUS Power, Rural Maintenance (PTY) Energia de Mocambique Lda., Vigeo (PTY) Ltd and ESKOM.

Mr. Eksten is a **Registered Professional Engineering Technologist** and has a Postgraduate Diploma in Management Development Programme and a National Higher Diploma (NHD) in Electrical Power Engineering. Further, he is a **Certified Instructor/Trainer**, a Senior member of the South African Institute Electrical Engineers (**SAIEE**) and holds a Certificate of Registration Membership Scheme from the Engineering Council of South Africa (**ESCA**). He has further delivered numerous trainings, courses, seminars, 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

0730 - 0800	Registration & Coffee
0800 - 0815	Welcome & Introduction
0815 - 0830	PRE-TEST
0830 - 0930	Overview of Medium Voltage (MV) Switchgear Definition & Applications of MV Switchgear • Key Components of MV Switchgear Systems • Advantages of Eaton MV Switchgear • Role of MV Switchgear in Power Distribution
0930 - 0945	Break
0945 - 1045	Types of MV Switchgear & their Configurations Air-Insulated versus Gas-Insulated Switchgear • Metal-Enclosed & Metal-Clad Configurations • Fixed versus Withdrawable Circuit Breakers • Selection Criteria for Different Applications
1045 - 1145	Electrical Safety Standards & Regulations Understanding IEC & IEEE Standards • Importance of OSHA Guidelines in MV Systems • Safety Protocols for Switchgear Operation • Compliance & Regulatory Requirements
1145 - 1230	Personal Protective Equipment (PPE) for MV Operations Types of PPE Required for MV Switchgear Tasks • Arc Flash Protection Guidelines • PPE Maintenance & Inspection • Training Requirements for PPE Usage
1230 - 1245	Break
1245 - 1330	Switchgear Safety Precautions Lockout/Tagout (LOTO) Procedures • Isolation & Grounding of Equipment • Arc Flash Hazard Assessment & Mitigation • Pre-Operation Safety Checklist
1330 - 1420	Hazard Identification in MV Switchgear Systems Recognizing Electrical Hazards (Arc Flash, Shock) • Identifying Mechanical Hazards • Environmental Hazards & Safe Work Practices • Risk Assessment & Hazard Mitigation Techniques
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

0730 - 0830	MV Circuit Breakers Types of MV Circuit Breakers (Vacuum, SF6, Air) • Operating Principles of Circuit Breakers • Functions & Applications in MV Systems • Advantages & Limitations of Each Type
0830 - 0930	Instrument Transformers in MV Switchgear Role of Current & Voltage Transformers • Basic Operating Principles of CTs & VTs • Importance of Accurate Measurement & Protection • Maintenance & Testing of Instrument Transformers





0930 - 0945	Break
0945 - 1100	Protection Relays & Control Systems Function of Protection Relays in MV Systems • Types of Protection Relays (Overcurrent, Differential) • Configuration of Relay Settings • Troubleshooting Relay Issues
1100 - 1230	Busbars & Conductors Function & Types of Busbars in MV Systems • Importance of Busbar Insulation • Maintenance & Cleaning of Busbars • Fault Diagnosis Related to Busbars
1230 - 1245	Break
1245 - 1330	Operating Mechanisms & Interlocks Types of Operating Mechanisms (Spring, Motor-Driven) • Role of Interlocks in Switchgear Safety • Mechanical & Electrical Interlocks • Testing & Troubleshooting Interlocks
1330 - 1420	MV Switchgear Control & Monitoring Systems Overview of Control Circuits & Diagrams • Using SCADA for Monitoring MV Switchgear • Communication Protocols in Control Systems • Diagnostic Tools & Software
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

0730 - 0830	Preventive Maintenance Fundamentals Importance of Preventive Maintenance for MV Switchgear • Developing a Maintenance Schedule • Documenting & Tracking Maintenance Activities • Benefits of Preventive Over Reactive Maintenance
0830 - 0930	Inspection & Cleaning of MV Switchgear Components Guidelines for Visual Inspections • Cleaning Methods for Various Components • Checking Insulation Integrity • Identifying Wear & Tear
0930 - 0945	Break
0945 - 1100	Testing MV Circuit Breakers Primary & Secondary Injection Testing • Insulation Resistance & Contact Resistance Tests • Timing & Motion Analysis for Circuit Breakers • Recording & Interpreting Test Results
1100 - 1230	Thermal Imaging & Partial Discharge Testing Using Thermal Imaging for Hot Spot Detection • Identifying Partial Discharge Issues • Equipment for Thermal & Partial Discharge Testing • Analyzing Test Results to Prevent Failures
1230 - 1245	Break
1245 - 1330	Lubrication & Mechanical Maintenance Importance of Lubrication for Moving Parts • Types of Lubricants Suitable for Switchgear • Frequency & Application Methods • Identifying Signs of Mechanical Wear



1330 – 1420	Replacing & Upgrading Components Criteria for Replacing Aging Components • Upgrading Components for Improved Performance • Managing Spare Parts Inventory • Documenting Replacement Activities
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 – 0830	Troubleshooting MV Switchgear Failures Common Issues in MV Switchgear Operation • Systematic Approach to Troubleshooting • Root Cause Analysis Techniques • Case Studies of Typical MV Failures
0830 – 0930	Fault Detection & Diagnosis Identifying & Locating Faults in MV Systems • Using Fault Indicators & Diagnostic Tools • Interpreting Fault Alarms & Warnings • Responding to Different Fault Types
0930 – 0945	Break
0945 – 1100	Arc Flash & Fault Mitigation Techniques Understanding Arc Flash Causes & Consequences • Implementing Arc Flash Prevention Measures • Role of Arc-Resistant Switchgear in Safety • Emergency Response to Arc Flash Incidents
1100 – 1230	Responding to Electrical Emergencies Step-By-Step Emergency Response Plan • Evacuation & Isolation Procedures • Coordinating with Emergency Response Teams • Conducting Post-Incident Analysis
1230 – 1245	Break
1245 – 1330	Restoration & Recovery of MV Switchgear Steps for Restoring Power After a Fault • Inspecting & Repairing Affected Components • Testing System Functionality Post-Recovery • Documenting Restoration Activities
1330 – 1420	Documentation & Reporting for Fault Events Importance of Detailed Fault Documentation • Creating Incident Reports & Analysis • Recording Corrective Actions Taken • Using Reports for Future Preventive Measures
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



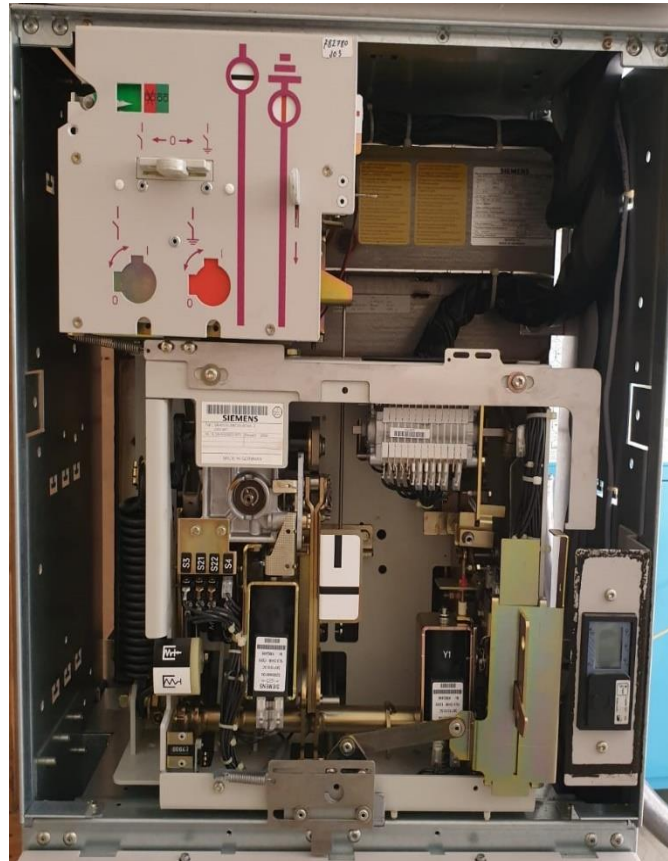
Day 5

0730 – 0830	Advanced Diagnostics & Monitoring Technologies <i>Online Monitoring Systems for MV Switchgear • Advanced Diagnostic Tools & Software • Real-Time Data Analysis & Predictive Maintenance • Benefits of Continuous Monitoring</i>
0830 – 0930	Energy Efficiency in MV Switchgear Operations <i>Strategies for Improving Energy Efficiency • Reducing Losses in MV Systems • Impact of Efficient Switchgear on Overall System Performance • Monitoring & Managing Energy Usage</i>
0930 – 0945	Break
0945 – 1100	Upgrades & Retrofitting of MV Switchgear <i>Identifying the Need for Upgrades or Retrofits • Benefits of Retrofitting Old Switchgear Systems • Integrating New Technologies into Existing Systems • Cost-Benefit Analysis of Upgrades</i>
1100 – 1215	Training & Competency Development for Operators <i>Importance of Ongoing Training for MV Switchgear Operators • Developing Competency-Based Training Programs • Certification Requirements for MV Operations • Assessing Operator Proficiency</i>
1215 – 1230	Break
1230 – 1345	Best Practices for MV Switchgear Operation & Maintenance <i>Overview of Industry Best Practices • Ensuring Adherence to Safety Protocols • Documentation & Continuous Improvement • Case Studies of Effective Maintenance Practices</i>
1345 – 1400	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

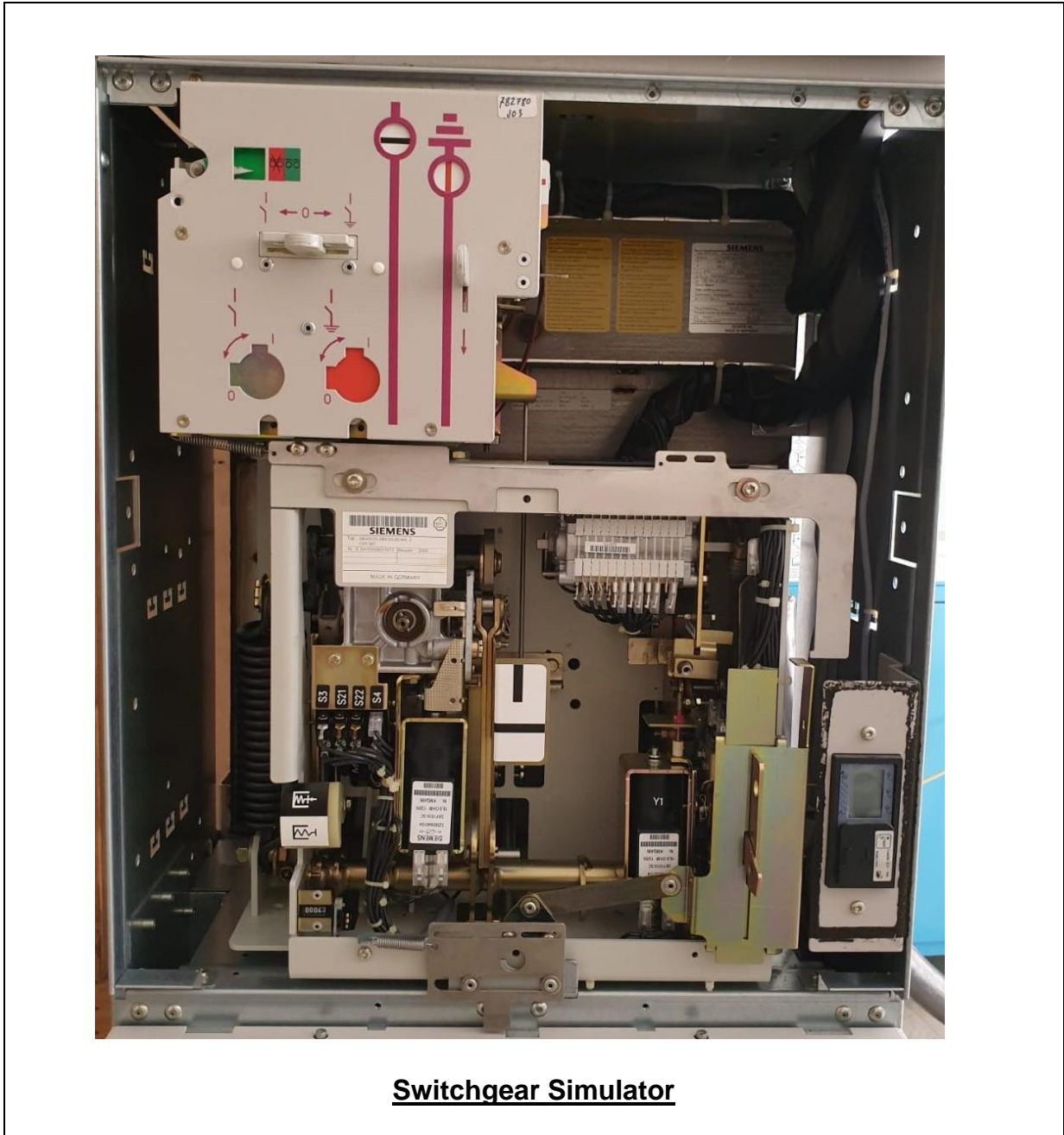
Simulators (Hands-on Practical Session s)

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 “Switchgear Simulator”, “GE Multilin Relay 469” and “GE Multilin Relay 750”.





Switchgear Simulator



Switchgear Simulator



GE Multilin Relay 469 Simulator

GE Multilin Relay 750 Simulator

Course Coordinator

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

