COURSE OVERVIEW EE1103
System Studies

Course Title
System Studies

Course Date/Venue
Session 1: June 30-July 04, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: November 10-14, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
EE1103

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 System Studies. It covers the types of system studies and its applications in water and electricity sectors; the components of a power system, electrical load and demand analysis; the methods of solving load flow and types of system stability; the factors affecting stability in power systems, stability studies and methods of analysis and power system control devices for enhancing stability; the fault analysis, load flow analysis, fault current calculations and protection coordination; the fault analysis in transformers and generators and the impact of faults on electrical machines; the protection schemes for transformers and generators; and the equipment stress during faults and mitigation techniques.

Further, the course will also discuss the methods for transient stability analysis, stability enhancement techniques and dynamic simulation of power systems; the automatic generation control (AGC), voltage control and reactive power management and interconnection of power systems; and the power system optimization techniques, system protection against dynamic events and forecasting and balancing renewable generation.

During this interactive course, participants will learn the smart grids and advanced metering infrastructure; the demand response management, power quality and harmonics analysis as well as grid modernization and control strategies; the energy storage systems (ESS), resilience analysis of power systems, climate change and its impact on power systems; the long-term power system planning and development, load forecasting and generation planning; the future trends in power system technologies, innovations in renewable energy integration, smart grid advancements and AI in power system management; the cybersecurity risks in power systems, threat analysis and mitigation in system studies; and the importance of securing control systems and data.

Course Objectives

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

- Apply and gain an in-depth knowledge on system studies
- Identify the types of system studies and its applications of system studies in water and electricity sectors
- Recognize the components of a power system, and apply electrical load and demand analysis and methods of solving load flow
- Identify the types of system stability, factors affecting stability in power systems, stability studies and methods of analysis and power system control devices for enhancing stability
- Apply fault analysis, load flow analysis, fault current calculations and protection coordination in fault analysis
- Carryout fault analysis in transformers and generators and discuss the impact of faults on electrical machines, protection schemes for transformers and generators and equipment stress during faults and mitigation techniques
- Employ methods for transient stability analysis, stability enhancement techniques and dynamic simulation of power systems
- Discuss automatic generation control (AGC), voltage control and reactive power management and interconnection of power systems
- Implement power system optimization techniques, system protection against dynamic events and forecasting and balancing renewable generation
- Recognize smart grids and advanced metering infrastructure and apply demand response management, power quality and harmonics analysis as well as grid modernization and control strategies
- Identify energy storage systems (ESS), apply resilience analysis of power systems and discuss climate change and its impact on power systems
- Carryout long-term power system planning and development, load forecasting and generation planning
- Discuss the future trends in power system technologies, innovations in renewable energy integration, smart grid advancements and AI in power system management
- Employ cybersecurity risks in power systems, threat analysis and mitigation in system studies and the importance of securing control systems and data

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 system studies for electrical engineers and technical professionals, project managers and product managers, policy makers and urban planners, business analysts and consultants, 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.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

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.

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.

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 workshop 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	***Fundamentals of System Studies*** *Definition and Importance of System Studies • Types of System Studies: Load Flow, Stability, Fault Analysis and Transients • Applications of System Studies in Water & Electricity Sectors • Overview of Power System Modeling*
0930 – 0945	*Break*
0945 – 1030	***Electrical Power System Overview*** *Components of a Power System: Generation, Transmission, Distribution • Power System Components' Characteristics • Electrical Load and Demand Analysis • Power Generation Sources: Conventional and Renewable*
1030 – 1130	***Load Flow Analysis*** *Importance and Objectives of Load Flow Studies • Methods of Solving Load Flow: Gauss-Seidel, Newton-Raphson and Fast-Decoupled • Load Flow Parameters: Voltage, Current, Power • Case Studies of Load Flow Analysis in Electrical Networks*
1130 – 1215	***System Stability*** *Types of System Stability: Transient, Dynamic and Voltage Stability • Factors Affecting Stability in Power Systems • Stability Studies and Methods of Analysis • Power System Control Devices for Enhancing Stability*
1215 – 1230	*Break*
1230 – 1330	***Fault Analysis*** *Types of Faults: Symmetrical and Unsymmetrical • Fault Analysis Techniques: Short-Circuit Calculations, Sequence Components • Impact of Faults on System Stability • Protection Systems Based on Fault Analysis*
1330 – 1420	***Simulation Tools & Software*** *Overview of Simulation Software Used in System Studies (e.g., PSS/E, DIgSILENT) • Setting Up Power System Models • Running Simulations and Interpreting Results • Hands-On Exercise Using Simulation 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 One*

Day 2

0730 – 0830	***Load Flow Analysis: Advanced Topics*** *Sensitivity Analysis in Load Flow Studies • Handling Voltage Constraints and Reactive Power Compensation • Multi-Area Systems and Their Impact on Load Flow • Case Study: Complex Network Load Flow Analysis*
0830 – 0930	***Fault Current Calculations*** *Short-Circuit Analysis and Fault Current Magnitude • Fault Impedance and its Role in Fault Current Calculation • Fault Location Analysis and Corrective Measures • Equipment Ratings and Fault Tolerance*

0930 – 0945	*Break*
0945 – 1100	***Protection Coordination in Fault Analysis*** *Relay Protection Principles and Settings • Coordination of Protection Devices during Faults • Fault Zone Identification and Selective Tripping • Case Study: Protection Schemes in Large Power Systems*
1100 – 1215	***Transformer & Generator Fault Analysis*** *Fault Analysis in Transformers and Generators • Impact of Faults on Electrical Machines • Protection Schemes for Transformers and Generators • Equipment Stress During Faults and Mitigation Techniques*
1215 – 1230	*Break*
1230 – 1330	***Transient Stability Studies*** *Introduction to Transient Stability • Methods for Transient Stability Analysis • Impact of Faults on Transient Stability • Case Study: Transient Analysis During System Disturbances*
1330 – 1420	***Stability Enhancement Techniques*** *Power System Stabilizers (PSS) • Use of FACTS (Flexible AC Transmission Systems) Devices • Role of Reactive Power Control in Stability • Dynamic Analysis of System Stability*
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	***Dynamic Simulation of Power Systems*** *Difference Between Steady-State and Dynamic Simulations • Modeling Dynamic Components: Generators, Turbines and Loads • Solving Dynamic Equations in System Studies • Case Study: Dynamic Simulation for Real-World Scenarios*
0830 – 0930	***Automatic Generation Control (AGC)*** *Importance of AGC in Power System Operations • AGC for Frequency Regulation and Load Balancing • Mathematical Modeling of AGC Systems • Case Study: AGC Implementation in Real Power Grids*
0930 – 0945	*Break*
0945 – 1100	***Voltage Control & Reactive Power Management*** *Role of Voltage Control in Maintaining System Stability • Methods for Reactive Power Compensation • Voltage Regulation and Optimization Strategies • Case Study: Reactive Power Management in Distribution Networks*
1100 – 1215	***Interconnection of Power Systems*** *Challenges in Interconnecting Power Systems • Frequency and Voltage Synchronization Between Systems • Case Studies on Interconnection of Renewable Sources • Control Strategies for Interconnected Systems*
1215 – 1230	*Break*
1230 – 1330	***Power System Optimization Techniques*** *Optimal Power Flow (OPF) and Its Significance • Economic Dispatch and Load Shedding Optimization • Optimal Placement of Control Devices in the System • Case Study: Optimization of Power Flow in Large Grids*

1330 – 1420	***System Protection Against Dynamic Events*** *Protection Strategies for Dynamic Events and Load Fluctuations • Protection during System Disturbances (e.g., Blackouts, System Islands) • Real-Time System Protection during Large Disturbances • Case Study: Protection Strategy Evaluation during Dynamic Events*
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

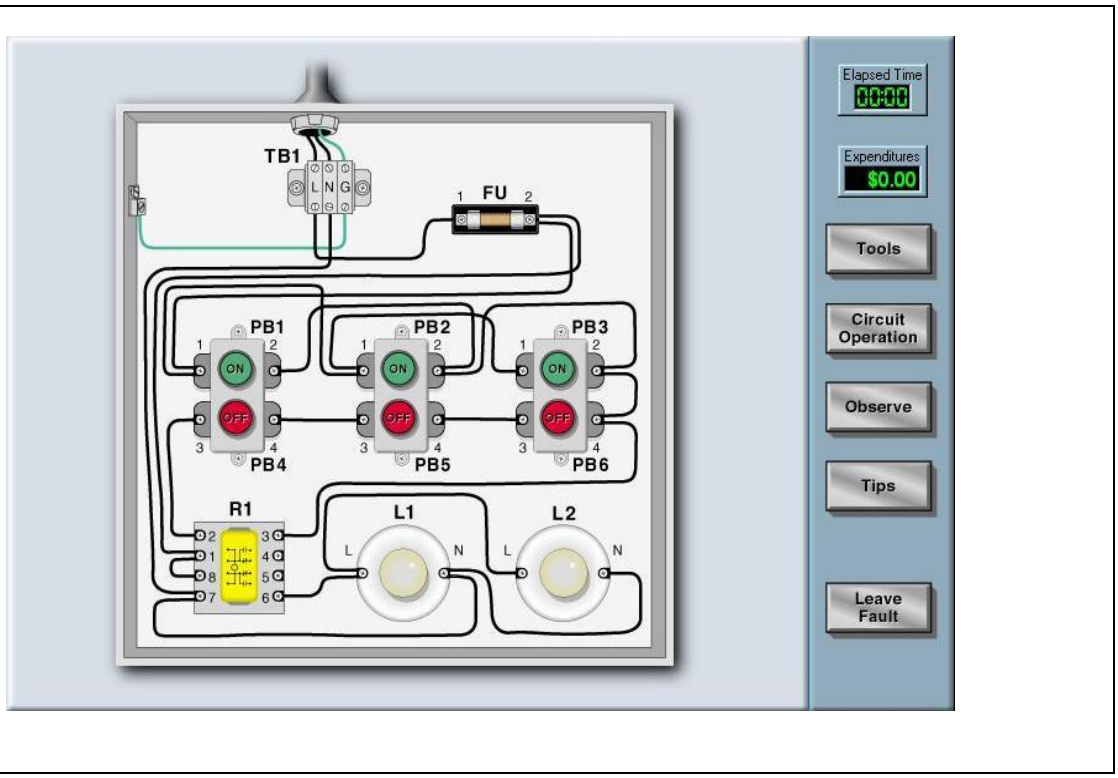
0730 – 0830	***Challenges in Integrating Renewable Energy*** *Variability and Intermittency of Renewable Energy Sources • Grid Stability Concerns with High Renewable Penetration • Forecasting and Balancing Renewable Generation • Case Study: Renewable Energy Integration in Large Grids*
0830 – 0930	***Smart Grids & Advanced Metering Infrastructure*** *Overview of Smart Grid Technologies • Advanced Metering Systems for Real-Time Data Collection • Role of SCADA Systems in Smart Grids • Case Study: Smart Grid Deployment and Integration*
0930 – 0945	*Break*
0945 – 1100	***Demand Response Management*** *Definition and Importance of Demand Response • Techniques for Effective Demand-Side Management • Integration of Demand Response in Smart Grids • Case Study: Demand Response Strategies in Large Power Networks*
1100 – 1215	***Power Quality & Harmonics Analysis*** *Power Quality Issues in Modern Electrical Networks • Harmonics Generation, Analysis and Mitigation • Impact of Harmonics on System Equipment and Performance • Power Quality Monitoring Tools and Techniques*
1215 – 1230	*Break*
1230 – 1330	***Grid Modernization & Control Strategies*** *Overview of Grid Modernization Techniques • Advanced Control Strategies for Grid Stability • Role of Data Analytics in Grid Modernization • Case Study: Grid Modernization Projects in the Water & Electricity Sector*
1330 – 1420	***Energy Storage Systems (ESS)*** *Role of Energy Storage in Stabilizing Grid Operations • Types of Energy Storage Systems: Batteries, Flywheels, Compressed Air • Integration of ESS Into Power Systems • Case Study: Large-Scale ESS Applications in Energy Grids*
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*

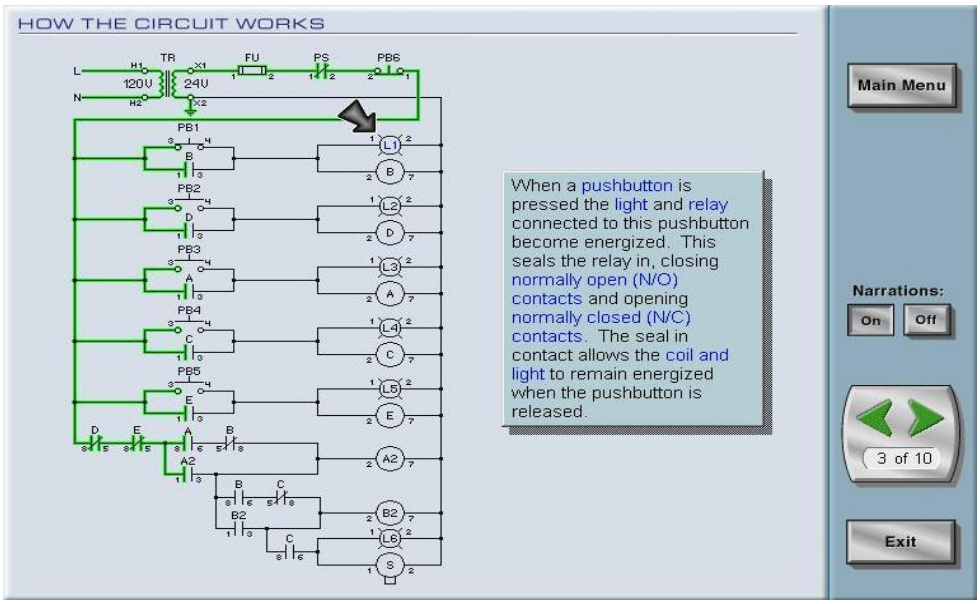
Day 5

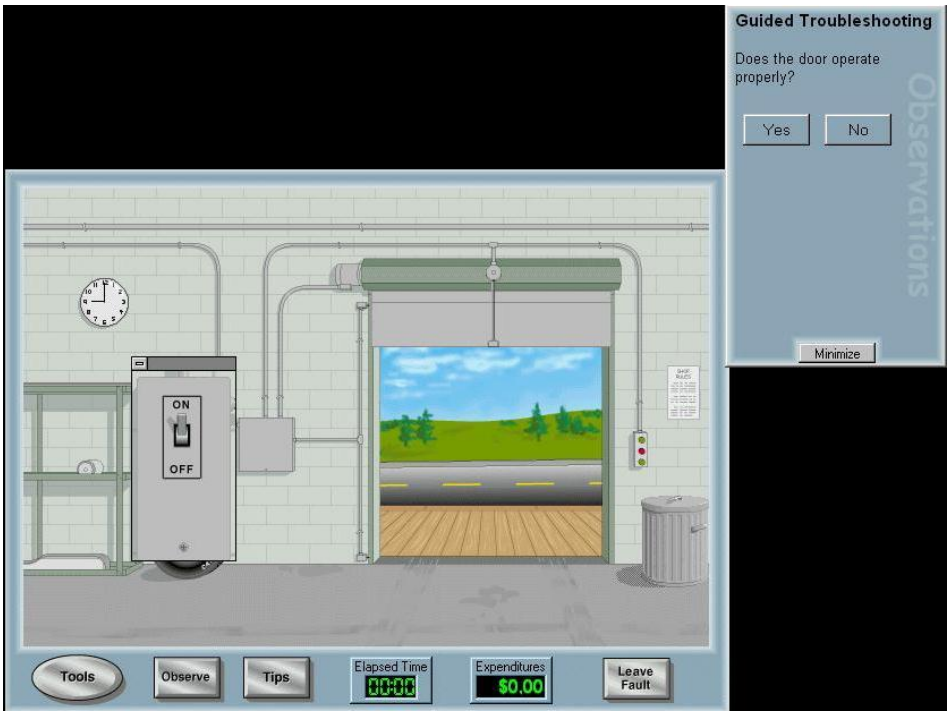
0730 – 0830	***Resilience Analysis of Power Systems*** *Defining Resilience in Power Systems • Resilience Metrics and Performance Indicators • System Robustness and Recovery Strategies • Case Study: Power System Resilience During Extreme Events*
0830 – 0930	***Climate Change & Its Impact on Power Systems*** *Understanding Climate Change Effects on Power Generation • Adaptation Strategies for Climate Change • Long-Term Forecasting and Planning for System Reliability • Case Study: Climate Change Modeling and Mitigation in Power Systems*
0930 – 0945	*Break*
0945 – 1100	***System Planning & Expansion Studies*** *Long-Term Power System Planning and Development • Load Forecasting and Generation Planning • Impact of Regulatory Changes on System Planning • Case Study: Expansion of Electricity Grids in Response to Growth*
1100 – 1215	***Future of Power Systems: Trends & Innovations*** *Future Trends in Power System Technologies • Innovations in Renewable Energy Integration • Smart Grid Advancements and AI in Power System Management • Case Study: Future Power Systems for Sustainable Development*
1215 – 1230	*Break*
1230 – 1345	***Cybersecurity in Power System Studies*** *Introduction to Cybersecurity Risks in Power Systems • Threat Analysis and Mitigation in System Studies • Importance of Securing Control Systems and Data • Case Study: Cybersecurity Breaches in Critical Infrastructure*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t 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

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