



COURSE OVERVIEW IE0102

Motor Actuator and Control Applications (Theory and Practical)

Course Title

Motor Actuator and Control Applications (Theory and Practical)

Course Date/Venue

Session 1: May 18-22, 2026/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Session 2: December 14-18, 2026/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE



Course Reference

IE0102

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 Motor Actuator and Control Applications. It covers the motor actuators, principles of electromechanical energy conversion; the fundamentals of motor control and key components in motor control systems; the motor and control system specifications and the principles of DC motors; the DC motor control techniques, robotics and automation, automotive applications and industrial machinery; troubleshooting and maintaining DC motors through identifying common faults, testing and diagnostics, maintenance schedules and replacement procedures; and the types of AC motors, construction and operation, rotating magnetic field principles and torque-speed characteristics.



Further, the course will also discuss the AC motor control techniques covering variable frequency drives (VFDs), soft starters and dynamic braking, speed and torque control and power factor correction; the AC motors applications for HVAC systems, industrial conveyors, pumping systems and renewable energy systems; the common faults in AC motors; the proper AC testing tools and procedures, predictive maintenance techniques and repair and replacement; the working principles of servo motors and closed-loop position; and the speed control, control systems for servo applications and comparison with stepper motors.

During this interactive course, participants will learn the stepper motor operation and types and microstepping techniques; the control methods for precision motion and common applications and limitations; the advanced control algorithms and integration of sensors in motor control; the integration of motor control in systems and energy efficiency and sustainability including internet of things (IoT) in motor control; the safety standards, hazard prevention in motor systems and regulatory compliance in different industries; and the documentation and reporting best practices.

Course Objectives

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

- Apply and gain an in-depth knowledge on motor actuator and control applications
- Discuss motor actuators, principles of electromechanical energy conversion, fundamentals of motor control and key components in motor control systems
- Recognize motor and control system specifications and the principles of DC motors
- Apply DC motor control techniques, robotics and automation, automotive applications and industrial machinery
- Troubleshoot and maintain DC motors through identify common faults as well as testing and diagnostics, maintenance schedules and replacement procedures
- Identify the types of AC motors, construction and operation, rotating magnetic field principles and torque-speed characteristics
- Carryout AC motor control techniques covering variable frequency drives (VFDs), soft starters and dynamic braking, speed and torque control and power factor correction
- Explain AC motors applications for HVAC systems, industrial conveyors, pumping systems and renewable energy systems
- Identify the common faults in AC motors and apply proper AC testing tools and procedures, predictive maintenance techniques and repair and replacement
- Recognize the working principles of servo motors, closed-loop position and speed control, control systems for servo applications and comparison with stepper motors
- Identify stepper motor operation and types and apply microstepping techniques, control methods for precision motion and common applications and limitations
- Apply advanced control algorithms and integration of sensors in motor control
- Integrate motor control in systems and apply energy efficiency and sustainability including internet of things (IoT) in motor control
- Review safety standards, hazard prevention in motor systems, regulatory compliance in different industries and documentation and reporting best practices

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 motor actuator and control applications for industrial engineers, technical engineers, instrumentation engineers, electrical engineers and other technical staff.

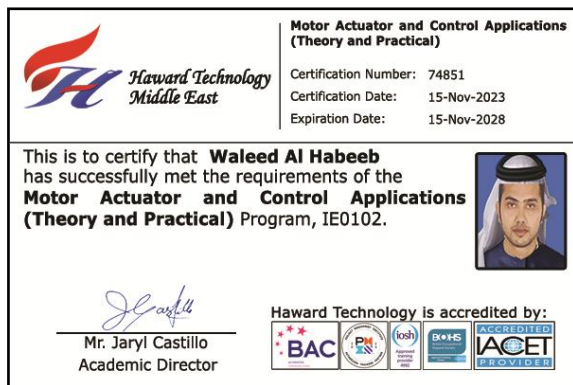
Course Certificate(s)

- (1) Internationally recognized Competency Certificates and Plastic Wallet Cards will be issued to participants who completed a minimum of 80% of the total tuition hours and successfully passed the exam at the end of the course. Certificates are valid for 5 years.

Recertification is FOC for a Lifetime.

Sample of Certificates

The following are samples of the certificates that will be awarded to course participants:-





- (2) Official Transcript of Records will be provided to the successful delegates with the equivalent number of ANSI/IACET accredited Continuing Education Units (CEUs) earned during the course.

* Haward Technology * CEUs * Haward Technology * CEUs * Haward Technology * CEUs * Haward Technology *

 **Haward Technology Middle East**
Continuing Professional Development (HTME-CPD)

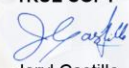
CEUs

CEU Official Transcript of Records

TOR Issuance Date: 15-Nov-23
HTME No. 74851
Participant Name: Waleed Al Habeeb

Program Ref.	Program Title	Program Date	No. of Contact Hours	CEU's
IE0102	Motor Actuator and Control Applications (Theory and Practical)	November 11-15, 2023	30	3.0

Total No. of CEU's Earned as of TOR Issuance Date **3.0**

TRUE COPY

Jaryl Castillo
Academic Director

Haward Technology has been approved as an Accredited Provider by the International Association for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this approval, Haward Technology has demonstrated that it complies with the ANSI/IACET 1-2018 Standard which is widely recognized as the standard of good practice internationally. As a result of their Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for programs that qualify under the ANSI/IACET 1-2018 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 Association 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 is accredited by



P.O. Box 26070, Abu Dhabi, United Arab Emirates | Tel.: +971 2 3091 714 | E-mail: info@haward.org | Website: www.haward.org

* Haward Technology * CEUs * Haward Technology * CEUs * Haward Technology * CEUs * Haward Technology *

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 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.

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:



Dr. Ahmed El-Sayed, PhD, MSc, BSc, is a **Senior Electrical & Instrumentation Engineer** with **30 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**, **Programmable 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**.

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 workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	<i>Registration & Coffee</i>
0800 – 0815	<i>Welcome & Introduction</i>
0815 – 0830	PRE-TEST
0830 – 0930	Overview of Motor Actuators <i>Types of Motors (DC, AC, Stepper, Servo) • Applications of Motor Actuators in Various Industries • Advantages and Limitations of Different Motor Types • Future Trends in Motor Actuator Technology</i>
0930 – 0945	<i>Break</i>
0945 – 1030	Principles of Electromechanical Energy Conversion <i>Basics of Electromagnetic Fields • Faraday's Law of Electromagnetic Induction • Magnetic Circuits and Reluctance • Energy Conversion in Motors</i>
1030 – 1130	Fundamentals of Motor Control <i>Definition and Purpose of Motor Control • Open-Loop versus Closed-Loop Systems • Key Control Parameters (Torque, Speed, Position) • Overview of Control Methods (Analog, Digital)</i>
1130 – 1215	Key Components in Motor Control Systems <i>Power Supply Requirements • Controllers and Drivers • Sensors and Feedback Systems • Safety Mechanisms</i>
1215 – 1230	<i>Break</i>
1230 – 1330	Motor & Control System Specifications <i>Torque-Speed Characteristics • Power Ratings and Efficiency • Duty Cycle and Thermal Considerations • Environmental and Operational Constraints</i>
1330 – 1420	Hands-On Practical: Introduction to Motor Actuators <i>Identifying Different Types of Motors • Demonstration of Basic Motor Operation • Measuring Torque and Speed • Simple Open-Loop Control Experiment</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 One</i>

Day 2

0730 – 0830	Principles of DC Motors Types of DC Motors (Shunt, Series, Compound) • Construction and Operation • Armature Reaction and Commutation • Torque-Speed Characteristics
0830 – 0930	DC Motor Control Techniques Voltage and Current Control Methods • PWM (Pulse Width Modulation) Techniques • Speed Control with Feedback • Starting and Braking Methods
0930 – 0945	Break
0945 – 1100	DC Motor Applications Robotics and Automation • Automotive Applications • Industrial Machinery • Consumer Electronics
1100 – 1215	Troubleshooting & Maintenance of DC Motors Common Faults in DC Motors • Testing and Diagnostics • Maintenance Schedules and Best Practices • Replacement Procedures
1215 – 1230	Break
1230 – 1330	Hands-On Practical: DC Motor Control Building a PWM-Based Speed Controller • Measuring Performance Parameters • Integrating Sensors for Feedback Control • Troubleshooting Motor Issue
1330 – 1420	Case Studies: DC Motor Applications Analysis of Real-World Examples • Challenges Faced in Implementation • Optimization Strategies • Lessons Learned
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	Principles of AC Motors Types of AC Motors (Induction, Synchronous) • Construction and Operation • Rotating Magnetic Field Principles • Torque-Speed Characteristics
0830 – 0930	AC Motor Control Techniques Variable Frequency Drives (VFDs) • Soft Starters and Dynamic Braking • Speed and Torque Control • Power Factor Correction
0930 – 0945	Break
0945 – 1100	Applications of AC Motors HVAC Systems • Industrial Conveyors • Pumping Systems • Renewable Energy Systems
1100 – 1215	Troubleshooting & Maintenance of AC Motors Common Faults in AC Motors • Testing Tools and Procedures • Predictive Maintenance Techniques • Repair and Replacement
1215 – 1230	Break
1230 – 1330	Hands-On Practical: AC Motor Control Configuring a VFD for Motor Control • Experimenting with Speed and Torque Adjustments • Monitoring Motor Performance • Diagnosing and Fixing Common Issues
1330 – 1420	Case Studies: AC Motor Applications Industrial Case Studies • Implementation Challenges and Solutions • Energy Efficiency Improvements • Cost-Benefit Analysis
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	Servo Motor Actuators & Control <i>Working Principles of Servo Motors • Closed-Loop Position and Speed Control • Control Systems for Servo Applications • Comparison with Stepper Motors</i>
0830 – 0930	Stepper Motor Actuators & Control <i>Stepper Motor Operation and Types • Microstepping Techniques • Control Methods for Precision Motion • Common Applications and Limitations</i>
0930 – 0945	Break
0945 – 1100	Advanced Control Algorithms <i>PID Controllers • Fuzzy Logic Control • Model Predictive Control • Adaptive Control Systems</i>
1100 – 1215	Integration of Sensors in Motor Control <i>Types of Sensors (Encoders, Hall-Effect, Current Sensors) • Role of Sensors in Feedback Systems • Sensor Integration with Microcontrollers • Calibration and Noise Reduction Techniques</i>
1215 – 1230	Break
1230 – 1330	Hands-On Practical: Advanced Motor Control <i>Implementing PID Control on a Motor • Using Encoders for Position Feedback • Real-Time Monitoring of System Performance • Troubleshooting Advanced Control Systems</i>
1330 – 1420	Case Studies: Advanced Motor Applications <i>High-Precision Robotics • Aerospace and Defense Systems • Renewable Energy Integration • Emerging Technologies</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	Lunch & End of Day Four

Day 5

0730 – 0830	Integration of Motor Control in Systems <i>Designing Complete Motor Control Systems • Communication Protocols (CAN, Modbus, Ethernet) • Multi-Motor Synchronization • System-Level Optimization</i>
0830 – 0930	Energy Efficiency & Sustainability <i>Energy-Saving Techniques in Motor Control • Role of Motors in Green Technologies • Lifecycle Analysis of Motor Systems • Future of Sustainable Motor Applications</i>
0930 – 0945	Break
0945 – 1100	Internet of Things (IoT) in Motor Control <i>IoT-Enabled Motor Control Systems • Remote Monitoring and Diagnostics • Predictive Maintenance Using IoT • Challenges and Opportunities</i>
1100 – 1215	Safety & Compliance Standards <i>Overview of Safety Standards (IEC, UL, ISO) • Hazard Prevention in Motor Systems • Regulatory Compliance in Different Industries • Documentation and Reporting Best Practices</i>
1215 – 1230	Break

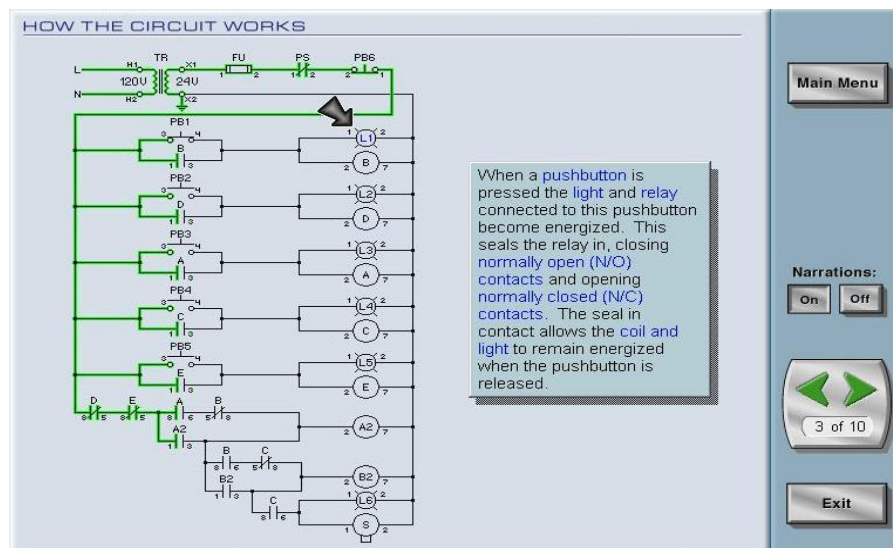
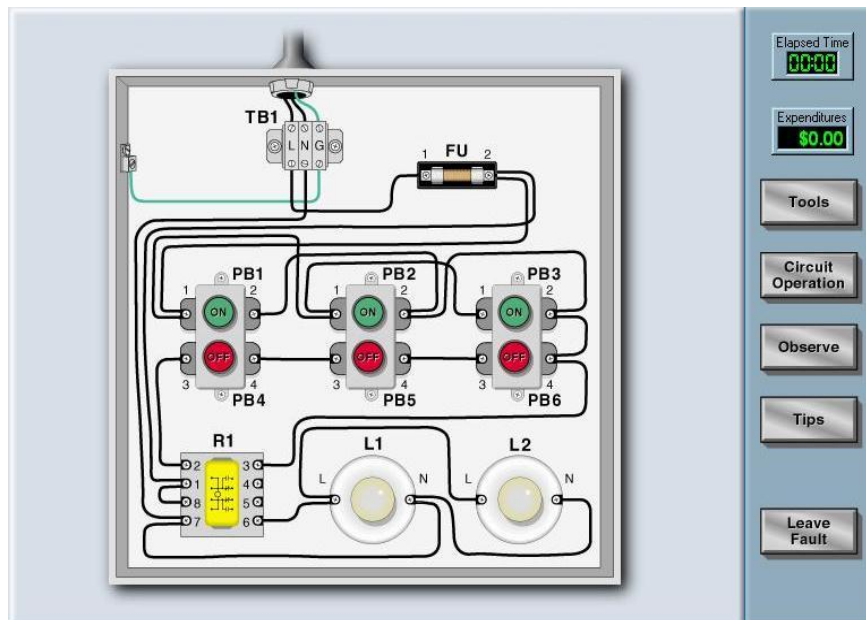


1230 – 1300	Hands-On Practical: System-Level Integration <i>Building a Complete Motor Control System • Testing and Validating Performance • Implementing Safety Features • Demonstrating IoT Capabilities</i>
1300 – 1315	Course Conclusion <i>Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course</i>
1315 – 1415	COMPETENCY EXAM
1415 – 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch & End of Course</i>



Simulators (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 Simutech Troubleshooting Electrical Circuits V4.1” and “Lab Volt Testing Device”.





Simutech Troubleshooting Electrical Circuits V4.1



Lab Volt Testing Device

Course Coordinator

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