



## COURSE OVERVIEW EE0367 Single-Phase Motor Applications

### Course Title

Single-Phase Motor Applications

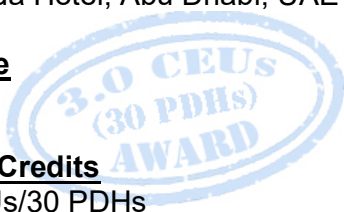
### Course Date/Venue

Session 1: May 04-08, 2025/Boardroom 1,  
Elite Byblos Hotel Al Barsha,  
Sheikh Zayed Road, Dubai, UAE  
Session 2: December 08-12, 2025/Fujairah  
Meeting Room, Grand Millennium  
Al Wahda Hotel, Abu Dhabi, UAE



### Course Reference

EE0367



### 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 three-phase motors. It covers the induction motors, squirrel-cage rotors, pole-phase relationships, torque, rotor speed, slip and frequency; resistance, reactance, power factor, stator, rotor construction and air gap and operating features; wound-rotor motors, brushes, slip rings, synchronous motors, motor fields, characteristics and applications; pull-in torque, slipping pole, power factor, brushless motors and multispeed motors



During this interactive course, participants will learn the consequent-pole, constant-horsepower, constant-torque, variable-torque & dual-voltage motors; care of stator, rotor windings and apply air gap, overload and single-phase operation; motor shaft currents, bearings and maintenance schedule; motor starters, limitations, full-voltage and across-the-line starting; reducing starting current including primary and secondary resistance starters and maintenance; three phase motor controllers, multiple start-stop controls, across-the-line reversing starters, plugging control and jogging.



Further, the course will also discuss the control surge, backspin and recognize alternators, characteristics, ratings and windings; three-phase alternators, air gap, slip rings, exciters including voltage regulation, load characteristics and effects; auxiliary generator systems, control equipment and transfer systems; safety switches, engine protection and prime movers and output control; power distribution systems, distribution voltages and heat loss; system grounding, overcurrent protection and ground relays including tripping; network protection.

### Course Objectives

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

- Apply and gain a comprehensive knowledge on three-phase motors
- Discuss induction motors, squirrel-cage rotors, pole-phase relationships, torque, rotor speed, slip and frequency
- Identify resistance, reactance, power factor, stator, rotor construction and air gap and operating features
- Determine wound-rotor motors, brushes, slip rings, synchronous motors, motor fields, characteristics and applications
- Recognize pull-in torque, slipping pole, power factor, brushless motors and multispeed motors
- Explain consequent-pole, constant-horsepower, constant-torque, variable-torque & dual-voltage motors
- Maintain, care of stator, rotor windings and apply air gap, overload and single-phase operation
- Implement motor shaft currents, bearings and maintenance schedule
- Identify motor starters, limitations, full-voltage and across-the line starting
- Apply reducing starting current including primary and secondary resistance starters and maintenance
- Illustrate three phase motor controllers, multiple start-stop controls, across-the-line reversing starters, plugging control and jogging
- Control surge, backspin and recognize alternators, characteristics, ratings and windings
- Determine three-phase alternators, air gap, slip rings, exciters including voltage regulation, load characteristics and effects
- Recognize auxiliary generator systems, control equipment and transfer systems
- carryout safety switches, engine protection and prime movers and output control
- Explain power distribution systems, distribution voltages and heat loss
- Determine system grounding, overcurrent protection and ground relays including tripping; network protection

### 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 three-phase systems for electrical engineers, electrical supervisors. Managers in charge of electrical installation, maintenance technicians, project engineers and other technical staff, who are involved in the selection, commissioning, installation, operation, testing, troubleshooting or maintenance of electrical equipment.


As per proposal

### 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: -

- 
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:



**Dr. Ahmed El-Sayed, PhD, MSc, BSc, is a Senior Electrical & Instrumentation Engineer with over 35 years of extensive experience in the Power, Petroleum, Petrochemical and Utilities. He specializes in HV/LV Equipment, High Voltage Electrical Safety, LV & HV Electrical System, HV Equipments Inspection & Maintenance, HV Switchgear Operation & Maintenance, LV Distribution Switchgear & Equipment, HV Switchgear Maintenance, HV/LV Electrical Authorisation, Hazardous**

**Area Classification, Power Quality, Disturbance Analysis, Blackout, Power Network, Power Distribution, Power Systems Control, Power Systems Security, Power Electronics, ETAP, Electrical Substations, Tariff Design & Structure Analysis, Engineering Drawings, Codes & Standards, P&ID Reading, Interpretation & Developing, PLC, SCADA, DCS, Process Control, Instrumentation, Automation, Power Generation, Process Control Instrumentation, SIS, SIL, ESD, Alarm Management Systems, Fieldbus Systems and Fiber Optics as well as the service pricing of these. 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** and also in Teaching and Consulting. His vast industrial experience was honed greatly when he joined many International and National Companies such as **Siemens, Electricity Authority and ACETO** industries 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 is well-versed in different electrical and instrumentation fields like Load Management Concepts, **PLC Programming, Installation, Operation and Troubleshooting, AC Drives Theory, Application and Troubleshooting, Industrial Power Systems Analysis, AC & DC Motors, Electric Motor Protection, DCS SCADA, Control and Maintenance Techniques, Industrial Intelligent Control System, Power Quality Standards, Power Generators and Voltage Regulators, Circuit Breaker and Switchgear Application and Testing Techniques, Transformer and Switchgear Application, Grounding for Industrial and Commercial Assets, Power Quality and Harmonics, Protective Relays (O/C Protection, Line Differential, Bus Bar Protection and Breaker Failure Relay)** and Project Management Basics (PMB).

Dr. Ahmed has **PhD, Master's & Bachelor's** degree in **Electrical and Instrumentation Engineering** from the **University of Wisconsin Madison, USA**. Further, he has numerous 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 Fee**

**US\$ 5,500** per Delegate. 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 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	<i>Registration &amp; Coffee</i>
0800 – 0815	<i>Welcome &amp; Introduction</i>
0815 – 0830	<b>PRE-TEST</b>
0830 – 0900	<b><i>Introduction to Three Phase Motors</i></b>
0900 - 0930	<b><i>Induction Motors</i></b>
0930 - 0945	<i>Break</i>
0945 – 1030	<b><i>Squirrel-Cage Rotors</i></b>
1030 – 1130	<b><i>Pole-Phase Relationships</i></b>
1130 – 1200	<b><i>Torque, Rotor Speed, Slip &amp; Frequency</i></b>
1200 – 1230	<b><i>Resistance, Reactance &amp; Power Factor</i></b>
1230 – 1245	<i>Break</i>
1245 – 1315	<b><i>Inductor Motors</i></b>
1315 – 1345	<b><i>Stator &amp; Rotor Construction</i></b>
1345 - 1420	<b><i>Air Gap &amp; Operating Features</i></b>
1420 – 1430	<b><i>Recap</i></b>
1430	<i>Lunch &amp; End of Day One</i>

**Day 2**

0730 - 0800	<b><i>Wound-Rotor Motors</i></b>
0800 – 0830	<b><i>Brushes &amp; Slip Rings</i></b>
0830 – 0900	<b><i>Synchronous Motors</i></b>
0900 – 0930	<b><i>Motor Fields, Characteristics &amp; Applications</i></b>
0930 - 0945	<i>Break</i>





0945 – 1030	<b><i>Pull-in Torque &amp; Slipping Pole</i></b>
1030 – 1130	<b><i>Power Factor &amp; Brushless Motors</i></b>
1130 – 1230	<b><i>Motor Efficiency &amp; Care</i></b>
1230 – 1245	<i>Break</i>
1245 – 1330	<b><i>Multispeed Motors</i></b>
1330 – 1420	<b><i>Consequent-Pole, Constant-Horsepower, Constant-Torque, Variable-Torque &amp; Dual-Voltage Motors</i></b>
1420 – 1430	<b><i>Recap</i></b>
1430	<i>Lunch &amp; End of Day Two</i>

**Day 3**

0730 - 0800	<b><i>Maintaining Three-Phase Motors</i></b>
0800 – 0830	<b><i>Cleaning &amp; Care of Stator &amp; Rotor Windings</i></b>
0830 – 0900	<b><i>Air Gap, Overload &amp; Single-Phase Operation</i></b>
0900 – 0930	<b><i>Motor Shaft Currents, Bearings &amp; Maintenance Schedule</i></b>
0930 - 0945	<i>Break</i>
0945 – 1030	<b><i>Motor Starters</i></b>
1030 – 1130	<b><i>Limitations, Full-Voltage &amp; Across-the Line Starting</i></b>
1130 – 1230	<b><i>Reducing Starting Current</i></b>
1230 – 1245	<i>Break</i>
1245 – 1330	<b><i>Primary &amp; Secondary Resistance Starters &amp; Maintenance</i></b>
1330 - 1420	<b><i>Three Phase Motor Controllers</i></b>
1420 – 1430	<b><i>Recap</i></b>
1430	<i>Lunch &amp; End of Day Three</i>

**Day 4**

0730 - 0800	<b><i>Multiple Start-Stop Controls</i></b>
0800 – 0830	<b><i>Across-the-Line Reversing Starters</i></b>
0830 – 0900	<b><i>Plugging Control &amp; Jogging</i></b>
0900 – 0930	<b><i>Controlling Surge &amp; Backspin</i></b>
0930 - 0945	<i>Break</i>
0945 – 1030	<b><i>Alternators</i></b>
1030 – 1130	<b><i>Characteristics, Ratings &amp; Windings</i></b>
1130 – 1230	<b><i>Three-Phase Alternators</i></b>
1230 – 1245	<i>Break</i>
1245 – 1330	<b><i>Air Gap, Slip Rings &amp; Exciters</i></b>
1330 - 1420	<b><i>Voltage Regulation, Load Characteristics &amp; Effects</i></b>
1420 – 1430	<b><i>Recap</i></b>
1430	<i>Lunch &amp; End of Day Four</i>

**Day 5**

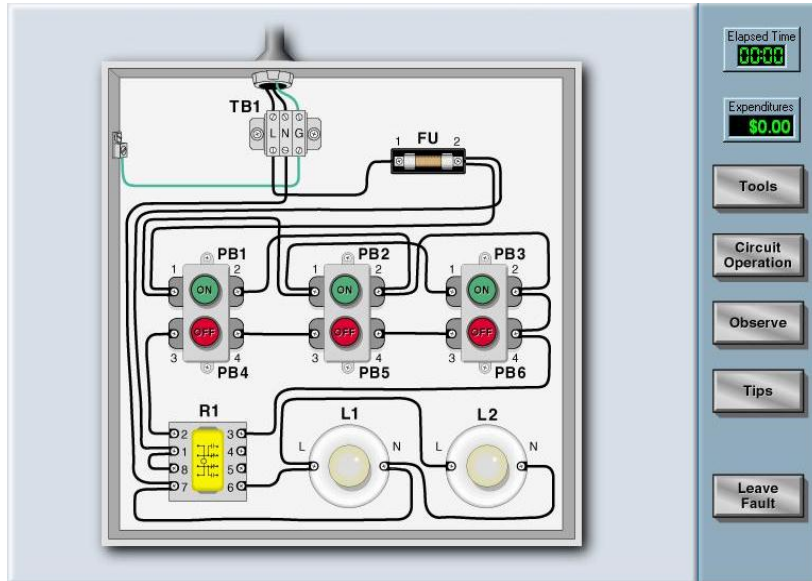
0730 - 0800	<b><i>Auxiliary Generator Systems</i></b>
0800 – 0830	<b><i>Control Equipment &amp; Transfer Systems</i></b>
0830 – 0930	<b><i>Safety Switches &amp; Engine Protection</i></b>
0930 - 0945	<i>Break</i>
0945 – 1030	<b><i>Prime Movers &amp; Output Control</i></b>
1030 – 1130	<b><i>Power Distribution Systems</i></b>
1130 – 1230	<b><i>Distribution Voltages &amp; Heat Loss</i></b>
1230 – 1245	<i>Break</i>



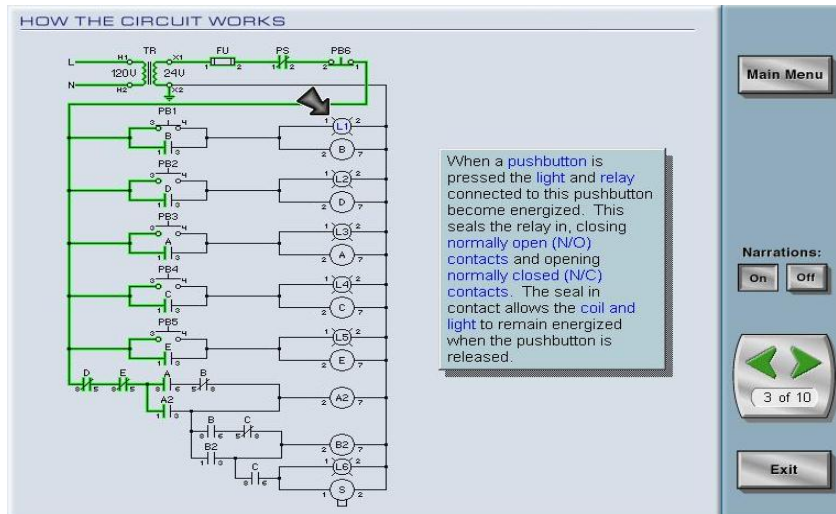
1245 - 1330	<i>System Grounding, Overcurrent Protection &amp; Ground Relays</i>
1330 - 1420	<i>Tripping; Network Protection</i>
1430 - 1445	<i>Course Conclusion</i>
1445 - 1500	<b>POST-TEST</b>
1415 - 1430	<i>Presentation of Course Certificates</i>
1500	<i>Lunch &amp; End of Course</i>

**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 “Haward Troubleshooting” and “Switchgear Simulator”.



**Basic Techniques**



**Basic Control Circuits**





**Guided Troubleshooting**

Does the door operate properly?

Yes No

Observations

Minimize

Tools Observe Tips Elapsed Time 00:00 Expenditures \$0.00 Leave Fault

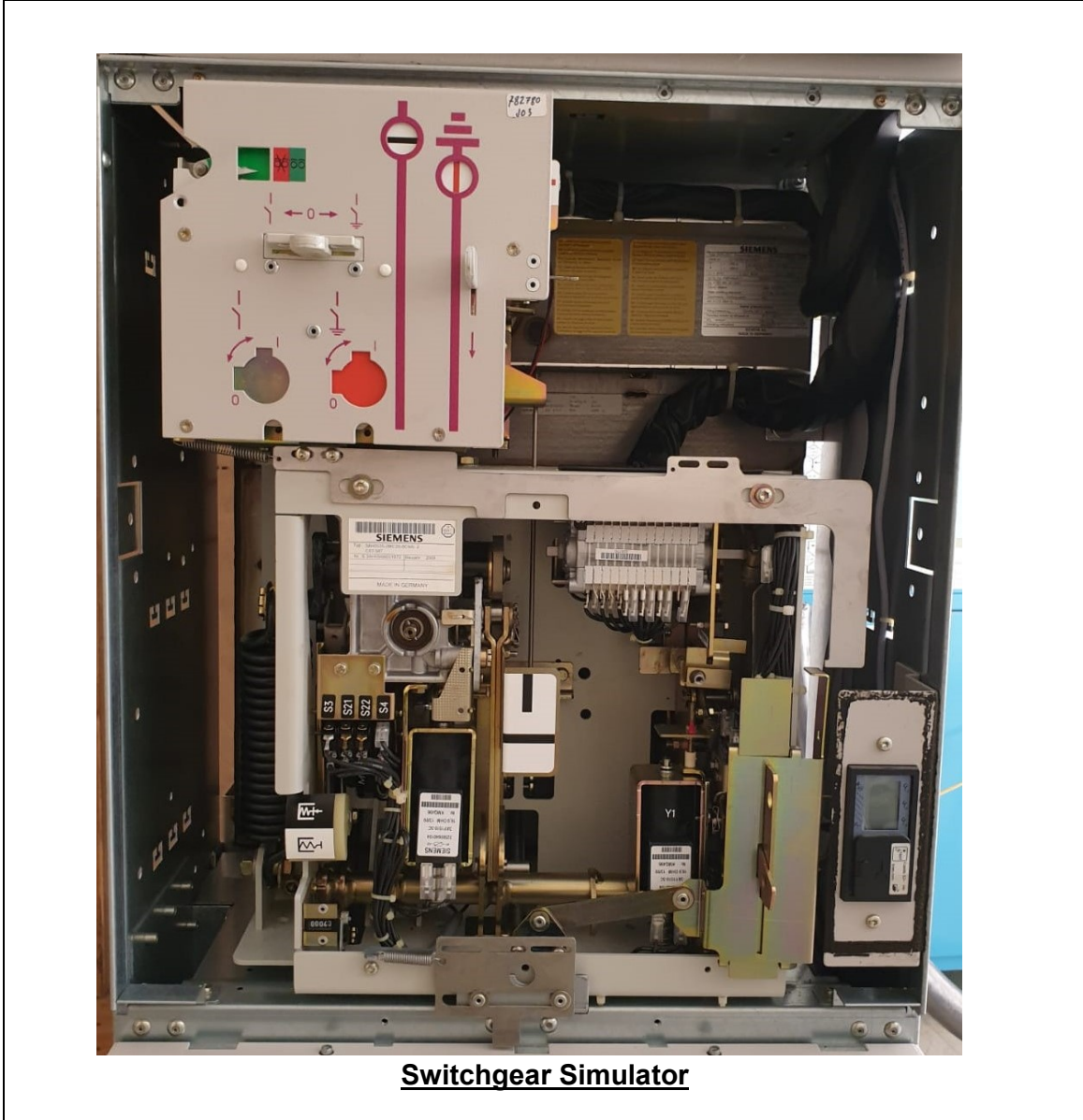
**Motor Control Techniques**











**Course Coordinator**

Mari Nakintu, Tel: +971 2 30 91 714, Email: [mari1@haward.org](mailto:mari1@haward.org)