

COURSE OVERVIEW EE0423

Electrical Motor Current Signature Analysis (MCSA)

Course Title

Electrical Motor Current Signature Analysis (MCSA)

Course Date/Venue

January 11-15, 2026/TBA Meeting Room,
Sofitel Kuala Lumpur Damansara, Kuala
Lumpur, Malaysia

Course Reference

EE0423

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 Electrical Motor Current Signature Analysis (MCSA). It covers the importance and applications of MCSA in predictive maintenance; the basic principles, benefits and limitations of MCSA; the basic electric motor principles; the types and characteristics of electric motors; the motor faults, failure modes, motor current signature and their interpretation; and the signal processing techniques, preprocessing techniques for noise reduction, time-domain analysis and frequency-domain analysis.



Further, the course will also discuss the relevant features from motor current signatures; the analysis techniques for fault detection and diagnosis; the pattern recognition algorithms for fault classification; the common motor faults and their corresponding current signature patterns; interpreting MCSA results to identify specific motor faults; the relationship between fault types and current signatures; the MCSA equipment and sensors the selection and installation of current sensors; the data acquisition systems for MCSA; and the calibration and verification of MCSA equipment.

During this interactive course, participants will learn the preparation and connection for MCSA testing; the testing procedures, data acquisition techniques and proper data analysis; the interpretation, challenges and MCSA troubleshooting; the advanced signal processing methods, wavelet analysis, time-frequency analysis, harmonic analysis and sideband analysis; the demodulation techniques for fault detection; integrating MCSA with overall condition monitoring systems; combining MCSA with vibration analysis and temperature monitoring; and the data fusion techniques for comprehensive motor health assessment.

Course Objectives

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

- Apply and gain an in-depth knowledge on electrical motor current signature analysis (MCSA)
- Discuss the importance and applications of MCSA in predictive maintenance
- Recognize the basic principles, benefits and limitations of MCSA
- Review the basic electric motor principles and identify the types and characteristics of electric motors
- Recognize motor faults, failure modes, motor current signature and their interpretation
- Carryout signal processing techniques, preprocessing techniques for noise reduction, time-domain analysis and frequency-domain analysis
- Extract relevant features from motor current signatures and apply analysis techniques for fault detection and diagnosis
- Illustrate pattern recognition algorithms for fault classification and identify the common motor faults and their corresponding current signature patterns
- Interpret MCSA results to identify specific motor faults and differentiate the relationship between fault types and current signatures
- Identify MCSA equipment and sensors as well as select and install current sensors
- Recognize data acquisition systems for MCSA and calibrate and verify MCSA equipment
- Apply motor preparation and connection for MCSA testing
- Implement testing procedures, data acquisition techniques, proper data analysis and interpretation and MCSA troubleshooting
- Employ advanced signal processing methods, wavelet analysis, time-frequency analysis, harmonic analysis and sideband analysis
- Apply demodulation techniques for fault detection and integrate MCSA with overall condition monitoring systems
- Combine MCSA with vibration analysis and temperature monitoring and apply data fusion techniques for comprehensive motor health assessment

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 a basic overview of all significant aspects and considerations of electrical motor current signature analysis (MCSA) for electrical engineers, maintenance technicians, plant or facility managers, condition monitoring specialists, reliability engineers, electrical technologists, motor manufacturers and suppliers and research and development personnel.

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

Haward's 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**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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 **30 years** of extensive experience in the **Power, Petroleum, Petrochemical** and **Utilities**. He specializes in **MCSA, Signal Processing Techniques, Motor Faults & MCSA Interpretation, MCSA Equipment & Instrumentation, Advanced MCSA Techniques, 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.

Accommodation

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

Course Fee

US\$ 8,800 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: Sunday, 11th of January 2026

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Introduction to MCSA <i>Electrical Motor Current Signature Analysis • Importance & Applications of MCSA in Predictive Maintenance • Basic Principles of MCSA • Benefits & Limitations of MCSA</i>
0930 – 0945	Break
0945 – 1100	Electric Motor Fundamentals <i>Review of Basic Electric Motor Principles • Types of Electric Motors & Their Characteristics</i>
1100 – 1230	Electric Motor Fundamentals (cont'd) <i>Motor Faults & Failure Modes</i>
1230 – 1245	Break
1245 – 1420	Electric Motor Fundamentals (cont'd) <i>Motor Current Signatures & Their Interpretation</i>
1420 – 1430	Recap
1430	Lunch & End of Day One

Day 2: Monday, 12th of January 2026

0730 – 0930	Signal Processing Techniques Fundamentals of Signal Processing in MCSA • Preprocessing Techniques for Noise Reduction
0930 – 0945	Break
0945 – 1100	Signal Processing Techniques (cont'd) Time-Domain Analysis: RMS, Peak Detection, Envelope Analysis • Frequency-Domain Analysis: Fourier Transform, Spectral Analysis
1100 – 1230	Feature Extraction & Analysis Extracting Relevant Features from Motor Current Signatures • Analysis Techniques for Fault Detection & Diagnosis
1230 – 1245	Break
1245 – 1420	Feature Extraction & Analysis (cont'd) Pattern Recognition Algorithms for Fault Classification • Case Studies & Examples of Feature Extraction & Analysis
1420 – 1430	Recap
1430	Lunch & End of Day Two

Day 3: Tuesday, 13th of January 2026

0730 - 0930	Motor Faults & MCSA Interpretation Common Motor Faults & Their Corresponding Current Signature Patterns • Faults such as Rotor Bar Defects, Stator Winding Faults, Bearing Faults, Etc.
0930 – 0945	Break
0945 – 1100	Motor Faults & MCSA Interpretation (cont'd) Interpreting MCSA Results to Identify Specific Motor Faults • The Relationship between Fault Types & Current Signatures
1100 – 1230	MCSA Equipment & Instrumentation MCSA Equipment & Sensors • Selection & Installation of Current Sensors
1230 – 1245	Break
1245 – 1420	MCSA Equipment & Instrumentation Data Acquisition Systems for MCSA • Calibration & Verification of MCSA Equipment
1420 – 1430	Recap
1430	Lunch & End of Day Three

Day 4: Wednesday, 14th of January 2026

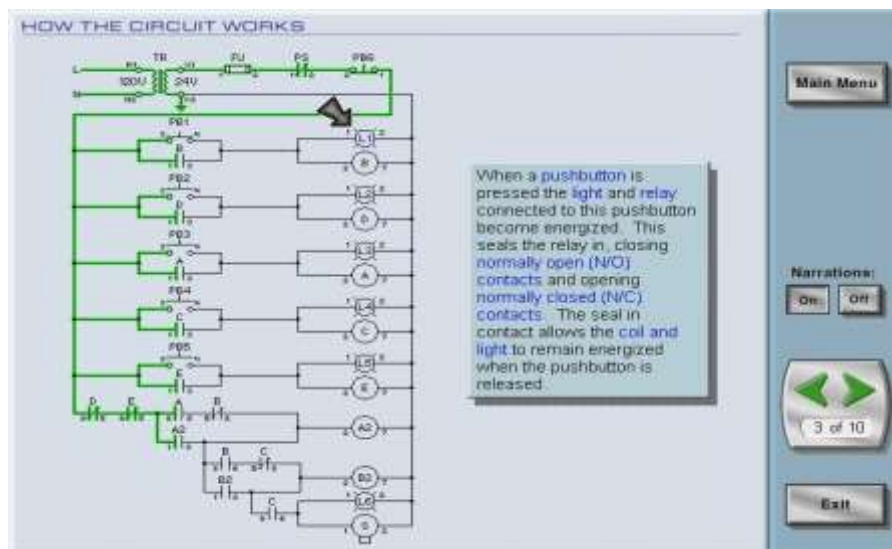
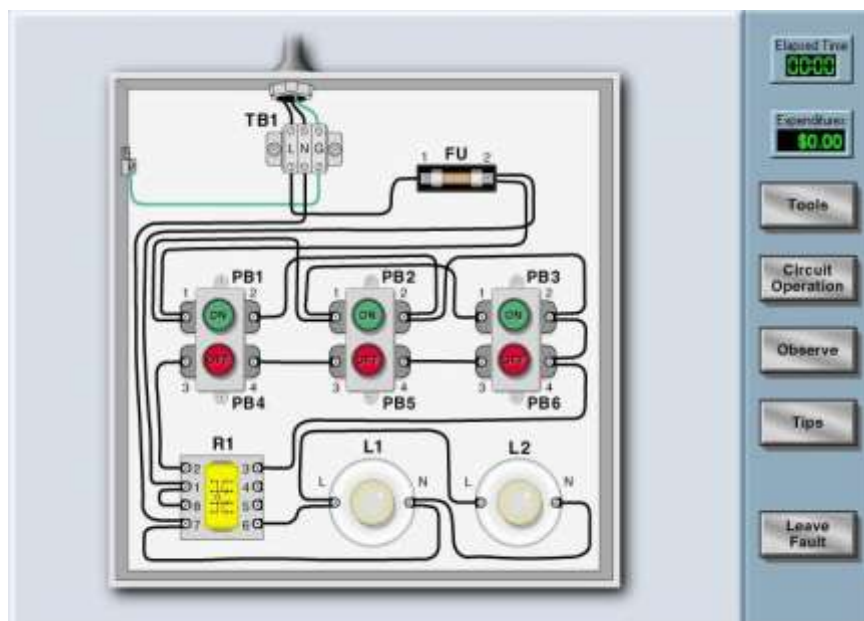
0730 – 0930	Practical Considerations in MCSA Motor Preparation & Connection for MCSA Testing • Testing Procedures & Data Acquisition Techniques
0930 – 0945	Break
0945 – 1100	Practical Considerations in MCSA (cont'd) Proper Data Analysis & Interpretation • Challenges & Troubleshooting in MCSA
1100 – 1230	Advanced MCSA Techniques Advanced Signal Processing Methods for MCSA • Wavelet Analysis & Time-Frequency Analysis
1230 – 1245	Break
1245 – 1420	Advanced MCSA Techniques (cont'd) Harmonic Analysis & Sideband Analysis • Demodulation Techniques for Fault Detection
1420 – 1430	Recap
1430	Lunch & End of Day Four

Day 5: Thursday, 15th of January 2026

0730 – 0930	Integration with Condition Monitoring Systems <i>Integration of MCSA with Overall Condition Monitoring Systems</i>
0930 – 0945	<i>Break</i>
0945 – 1100	Integration with Condition Monitoring Systems (cont'd) <i>Combining MCSA with Vibration Analysis & Temperature Monitoring</i>
1100 – 1230	Integration with Condition Monitoring Systems (cont'd) <i>Data Fusion Techniques for Comprehensive Motor Health Assessment</i>
1230 – 1245	<i>Break</i>
1245 – 1345	Integration with Condition Monitoring Systems (cont'd) <i>Case Studies on Successful Integration of MCSA in Maintenance Programs</i>
1345 – 1400	Course Conclusion
1400 – 1415	POST-TEST
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 carry out various exercises using our state-of-the-art “Troubleshooting Electrical Circuits V4.1 Simulator” and “Lab Volt Testing Device”.





Troubleshooting Electrical Circuits V4.1 Simulator



Lab Volt Testing Device

Course Coordinator

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