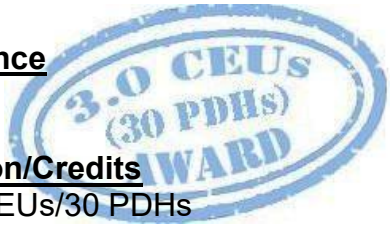
COURSE OVERVIEW EE0423
MCSA (Motor Current Signature Analysis)

Course Title
MCSA (Motor Current Signature Analysis)

Course Date/Venue
Session 1: July 26-30, 2026/TBA Meeting Room, Dinamo Hotel Baku, Baku, Azerbaijan
Session 2: August 09-13, 2026/TBA Meeting Room, Dinamo Hotel Baku, Baku, Azerbaijan



Course Reference
EE0423

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes real-life case studies where participants will be engaged in a series of interactive small groups and class workshops.

This course is designed to provide participants with a detailed and up-to-date overview of 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/Outcomes & Benefits for the Participants

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

- Apply and gain an in-depth knowledge on 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 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:

Mr. Pan Marave, PE, MSc, BEng, is a **Senior Electrical & Instrumentation Engineer** with over **30 years** of extensive experience in **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise includes **MCSA**, **Signal Processing Techniques**, **Advanced MCSA Techniques**, **CEMS** Operations and Maintenance, **ABB 11KV Distribution Switchgear**, Operation & Maintenance of **Rotork make MOVS**, **Maintaining Instrument Air Compressors**, **Circuit Breaker**, **HV Switchgear Maintenance**, **HV/LV Electrical** Authorisation, Basic **Electricity**, **Electrical & Special Hazards**, **Personnel Protection**, **HV/LV Equipment**, **Motor Controllers**, **Electrical Switching** Practices, **Emergency Planning**, **Safety Management**, Safety Instrumented Systems (**SIS**), Safety Integrity Level (**SIL**), Emergency Shutdown (**ESD**); **DCS**, **SCADA** & **PLC**; **Measurement** (**Flow**, **Temperature**, **Pressure**); **Process Analyzers** & **Analytical Instrumentation**; **Process Control**, **Instrumentation** & **Safeguarding**; **Process Controller**, **Control Loop & Valve Tuning**; Industrial **Distribution Systems**; Industrial **Control & Control Systems**, Power Systems **Protection & Relaying**; **Earthing**, **Bonding**, **Grounding**, **Lightning & Surge Protection**; Electric Power **Substation** & **Systems**; Electrical Engineering Principles; **Motor Control Circuit**; **Electrical Fault Analysis**; Electrical Networks & Distribution **Cables**; **Circuit Breakers**, **Switchgears**, **Transformers**, **Hazardous Areas Classification** and **Detailed Engineering Drawings**, **Codes** & **Standards**. Furthermore, he is also well-versed in Microprocessors Structure, Lead Auditor (**ISO 9000:2000**), **ISO 9002**, Quality Assurance, and Projects & Contracts Management.

Presently, Mr. Marave is the **Technical Advisor** of **Chamber of Industry & Commerce** in Greece. Prior to this, he gained his thorough practical experience through several positions as the **Technical Instructor**, **Engineering Manager**, **Electronics & Instruments Head**, **Electrical**, **Electronics & Instruments Maintenance Superintendent**, **Assistant General Technical Manager** and **Engineering Supervisor** of various international companies such as the **Alumil** Mylonas, **Athens Papermill**, **Astropol** and the **Science Technical Education**.

Mr. Marave is a **Registered Professional Engineer** and has **Master's** and **Bachelor's** degrees in **Electrical Engineering** from the **Polytechnic Institute of New York** and **Pratt Institute of New York** (**USA**) respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and an active member of the **Technical Chamber** and the Institute of Electrical and Electronics Engineer (**IEEE**) in Greece. He has presented and delivered **numerous international** courses, conferences, trainings and workshops worldwide.

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.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

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.

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	***Introduction to MCSA*** *Electrical Motor Current Signature Analysis ● Importance & Applications of MCSA in Predictive Maintenance ● Basic Principles of MCSA ● Benefits & Limitations of MCSA*
0930 – 0945	*Break*
0945 – 1100	***Electric Motor Fundamentals*** *Review of Basic Electric Motor Principles ● Types of Electric Motors & Their Characteristics*
1100 – 1230	***Electric Motor Fundamentals (cont'd)*** *Motor Faults & Failure Modes*
1230 - 1245	*Break*
1245 – 1420	***Electric Motor Fundamentals (cont'd)*** *Motor Current Signatures & Their Interpretation*
1420 -1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

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

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

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

0730 – 0930	***Integration with Condition Monitoring Systems*** *Integration of MCSA with Overall Condition Monitoring Systems*
0930 – 0945	*Break*
0945 – 1100	***Integration with Condition Monitoring Systems (cont'd)*** *Combining MCSA with Vibration Analysis & Temperature Monitoring*
1100 – 1230	***Integration with Condition Monitoring Systems (cont'd)*** *Data Fusion Techniques for Comprehensive Motor Health Assessment*
1230 – 1245	*Break*
1245 - 1345	***Integration with Condition Monitoring Systems (cont'd)*** *Case Studies on Successful Integration of MCSA in Maintenance Programs*
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-

Course Coordinator

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