COURSE OVERVIEW EE0794
Motor Control Center (MCC) Maintenance

Course Title
Motor Control Center (MCC) Maintenance

Course Date/Venue
Session 1: July 06-10, 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
EE0794

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

Course Description

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

The course is designed to provide participants with a detailed and an up-to-date overview of switchgear and MCC (Motor Control Centre) principle. It covers the electrical safety standards; LV switchgear; the operation of LV circuit breakers; the consequences of harmonics on the installation, the principles of circuit breaker cut-off and the ranges of LV circuit breaker; the MV switchgear and the functions, characteristics, standards and technology of switchgear; the distribution methods and the function interlocks, padlocking and operation interlocks; the standard operations on the various bays; the preventive maintenance and the technology of circuit breakers and switchgear; and the switching, safety and earthing requirements, MCC's for LV distribution boards and the MV distribution switchgear.

At the completion of the course, participants will be able to operate various types of interrupting equipment; perform MCC testing and refurbishment; troubleshoot switchgear using diagrams and manufacturer's manuals; illustrate block diagrams, line diagrams, wiring diagrams, interlock diagrams; apply the required maintenance for condition, heaters, fuses, mechanism and overhaul in a weekly, monthly and yearly basis; and identify and repair of problems/failures.

Course Objectives

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

- Apply and gain a good working knowledge on switchgear and MMC principle
- Discuss electrical safety standards and LV switchgear
- Operate LV circuit-breakers and identify the consequences of harmonics on the installation, the principles of circuit-breaker cut-off and the ranges of LV circuit breaker including its characteristics and performance
- Describe MV switchgear the functions, characteristics, standards and technology of switchgear
- Carryout distribution methods and identify the function interlocks, padlocking and operation interlocks
- Employ standard operations on the various bays
- Implement preventive maintenance and discuss the technology of circuit breakers and switchgears
- Recognize switching, safety and earthing requirements, MCC's for LV distribution boards and MV distribution switchgear
- Operate various types of interrupting equipment and describe the mechanisms of deterioration of insulation
- Perform MCC testing and refurbishment as well as troubleshoot switchgear using diagrams and manufacturers manuals
- Illustrate block diagrams, line diagrams, wiring diagrams and interlock diagrams
- Apply the required maintenance for condition, heaters, fuses, mechanism and overhaul in a weekly, monthly and yearly basis
- Explain the principles of circuit breaker maintenance covering mechanisms and mechanical aspects
- Identify and repair problems/failures as well as explain transient phenomena occurring and opening or closing switchgear
- Describe electric arc and specify the right motor control for the job

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 switchgear and MCC (motor control centre) principle for MTCE technicians.

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:

Mr. Pan Marave, PE, MSc, BEng, is a **Senior Electrical & Instrumentation Engineer** with over **40 years** of extensive experience in **Oil**, **Gas**, **Petrochemical**, **Refinery** & **Power** industries. His expertise includes **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** and **Bachelor** 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.

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.

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 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	***Reminder of Electrical Safety Standards***
0930 - 0945	*Break*
0945 – 1100	***Introduction to LV Switchgear*** *Single Line Diagrams ● What is a Power Network? ● Why Different Voltage Levels? ● Network Components ● Active and Passive ● Typical Examples ● Simple Busbar and Substation layouts ● Protection and Control Circuits Fault Levels & MVA Rating of Equipment ● Measuring Transformers VT's and CT's ● Circuit Breaker Utilization, Disconnector Operation and Earthing Switches ● Fuses , LV and HV Fuses. Fuse Gear ● Air Break Switches*
1100 - 1230	***Operate LV Circuit-breakers*** *Understand all the Data Written on a Circuit-breaker ● Consequences of Harmonics on the Installation ● Understand the Principles of Circuit-Breaker Cut-off ● Know the Ranges of LV Circuit-breakers, Their Characteristics and Performance*
1230 - 1245	*Break*
1245 – 1330	***Introduction to MV Switchgear***
1330 - 1420	***Knowledge of the Switchgear*** *Functions ● Characteristics ● Standards ● Technology*
1420 - 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Distribution Methods*** *Single Feeder, Double Feeder ● Automatic Transfer ● Ring Main ● Normal-Emergency ● Coupling*
0930 – 0945	*Break*
0945 – 1100	***Interlocks*** *Function Interlocks and Padlocking ● Operation Interlocks*

1100 - 1230	***Standard Operations on the Various Bays***
1230 – 1245	*Break*
1245 – 1330	***Preventive Maintenance***
1330 – 1420	***The Technology of Circuit Breakers and Switchgear*** *Typical Substation Arrangements and MCC's ● Definitions and Terminology ● Fault Level Calculations ● Motor and Generator Fault Contributions ● Low voltage Equipment ● Medium Voltage Equipment ● High Voltage Equipment ● Name Plate Ratings – Interpretation ● CT's and VT's Basic Protection Requirements*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Switching, Safety & Earthing Requirements*** *Busbar Configurations, Single, Double, Sectionalized and Breaker and a Half ● Main Substation Earthing and Bonding ● Step and Touch Potentials Danger to Personnel ● Routine Testing and Certification of Substation Earthing ● Interrupter Classification – Mechanisms, Motor Spring, Hydraulic and Solenoid ● Switching Requirements Interrupting Time ● Auto Reclosing Considerations Ring Main and Radial Circuits*
0930 – 0945	*Break*
0945 – 1100	***MCC's for LV distribution boards*** *Rating of Switchgear – Normal and Fault Duties ● Selection and Checking for Correct Switchgear Ratings LV, MV, HV and EHV*
1100 - 1230	***MV Distribution Switchgear*** *Primary Substations, Name Plate Data ● Device Function Numbers, Suffix Letters, Main Devices and Auxiliary Devices ● Vacuum Switchgear up to 36kV ● Description of Equipment ● Front, Rear, Cable Entry and Busbar ● Vaccum Principles of Interuption ● Air and SF6 External Insulation of Busbars and Vacuum Interrupters ● Maintenance Requirements Air, Oil, Vacuum and SF6 3*
1230 – 1245	*Break*
1245 – 1330	***Operation of Various Types of Interrupting Equipment*** *Fuse Motor Starting Types ● Fused Switches ● Moulded Case Type Breakers ● Air break Switches ● Vacuum Contactors – Fused ● Vacuum Circuit Breakers ● SF6 Puffer, Rotating Arc Devices ● Special Insulating Requirements for 36kV ● Solid and Gaseous Insulation –Problems ● Maintenance and Testing ● Health and Safety in Substations*
1330 – 1420	***Mechanisms of Deterioration of Insulation***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***MCC Testing & Refurbishment – Contacts & Arc Chutes***
0930 – 0945	*Break*
0945 – 1100	***Trouble Shooting – Use of Diagrams & Manufacturers Manuals***
1100 - 1230	***Block Diagrams, Line Diagrams, Wiring Diagrams &Interlock Diagrams***
1230 – 1245	*Break*

1245 – 1330	***Required Maintenance – Condition, Heaters, Fuses, Mechanism, Overhaul***
1330 – 1420	***Weekly, Monthly, Yearly Program of Maintenance – 5 years & More?***
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Transient Phenomena Occurring & Opening or Closing Switchgear***
0930 – 0945	*Break*
0945 – 1100	***Principles of Circuit Breaker Maintenance – Mechanisms & Mechanical Aspects***
1100 - 1230	***The Identification & Repair of Problems/ Failures***
1230 – 1245	*Break*
1245 – 1315	***Electrical Arc***
1315 - 1345	***How to Specify the Right Motor Control Center For the Job*** *General Description ● Feature and Layout Guide ● Standard Structures and Structure Options ● NEMA Wiring Classifications ● Bus System● Starter Units ● Dc Starter Units ● Feeder Tap Units ● Device Panel ● Maintenance ● Motor Protection*
1345 - 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
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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