COURSE OVERVIEW LE0444
Maintenance and Calibration of Laboratory Equipment

Course Title
Maintenance and Calibration of Laboratory Equipment

Course Date/Venue
July 19-23, 2026/Tactic Meeting Room, Aloft Dharan Hotel, Al Khobar, KSA

3.0 CEUs (30 PDHs) AWARD

Course Reference
LE0444

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

Course Description

This practical and highly-interactive course includes practical sessions and exercises where participants will visit the laboratory and they will be introduced to various lab instruments. Practical sessions will be performed using one of the lab equipment in order to apply the theory learnt in the class.

This course is designed to provide participants with a detailed and up-to-date overview of Maintenance and Calibration of Laboratory Equipment. It covers the types of laboratory equipment, equipment classification based on function and critical versus non-critical equipment; the equipment maintenance, laboratory safety and equipment handling, equipment documentation and records and calibration concepts; the regulatory and quality standards and ISO/IEC 17025 requirements; and the good laboratory practice (GLP), FDA and GMP considerations and audit and compliance requirements.

Further, the course will also discuss the analytical balances maintenance, pH meters maintenance, centrifuges maintenance and microscopes maintenance; the spectrophotometers maintenance, temperature monitoring and control, defrosting procedures, alarm systems and backup power; the sample storage best practices of refrigerators and freezers; the calibration intervals and scheduling, balance calibration, temperature equipment calibration and volume measurement calibration; and the pressure and vacuum calibration and electrical equipment calibration.

During this interactive course, participants will learn the preventive maintenance, troubleshooting laboratory equipment, equipment qualification and validation and environmental control in laboratories; the risk management in equipment maintenance, quality assurance in calibration and audit preparation and compliance; the key elements of calibration reports, measurement uncertainty reporting, acceptance criteria documentation and record retention policies; the equipment lifecycle management, best practices in laboratory maintenance; and the future trends in laboratory equipment.

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 maintenance and calibration of laboratory equipment
- Identify the types of laboratory equipment, equipment classification based on function and critical versus non-critical equipment
- Carryout equipment maintenance, laboratory safety and equipment handling, equipment documentation and records and calibration concepts
- Review regulatory and quality standards covering ISO/IEC 17025 requirements, good laboratory practice (GLP), FDA and GMP considerations and audit and compliance requirements
- Apply analytical balances maintenance, pH meters maintenance, centrifuges maintenance, microscopes maintenance and spectrophotometers maintenance
- Carryout temperature monitoring and control, defrosting procedures, alarm systems and backup power, sample storage best practices of refrigerators and freezers
- Employ calibration intervals and scheduling, balance calibration, temperature equipment calibration, volume measurement calibration, pressure and vacuum calibration and electrical equipment calibration
- Apply preventive maintenance, troubleshooting laboratory equipment, equipment qualification and validation and environmental control in laboratories
- Carryout risk management in equipment maintenance, quality assurance in calibration and audit preparation and compliance
- Recognize key elements of calibration reports, measurement uncertainty reporting, acceptance criteria documentation and record retention policies
- Apply equipment lifecycle management, best practices in laboratory maintenance and future trends in laboratory equipment

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 maintenance and calibration of laboratory equipment for laboratory technicians, laboratory analysts, QA/QC personnel, calibration technicians, maintenance technicians, instrument technicians, laboratory supervisors, engineers responsible for laboratory equipment, metrology personnel, anyone responsible for maintenance, calibration or performance verification of laboratory equipment and other technical staff.

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:

Professor Robert McCrindle, PhD, MSc, BSc, is a **Senior Analytical Chemist** with over **30 years** of industrial experiences in **Analytical** and **Chemical Laboratory Management**. His expertise extends over the fields of **Process Analyzers & Analytical Instrumentation**, **Analytical Chemistry & Process Analyzers**, **Process Analyzer** Technology, **Analytical Chemistry** & Precise Results Generation, Uncertainty of Measurement & **Method Validation** in Accordance with **ISO 17025**, **Instrument** Calibration & Testing, Practical Statistical Analysis of **Lab Data**, Modern **Chemical Laboratory** Operations, **Analytical Instrumentation & Equipment** Calibration, **Chemical Analysis** Practical Problem Solving, **Gas Chromatography** Operation & Troubleshooting, **Method Validation**, Uncertainty Measurement, Statistical Process Control (**SPC**), **Laboratory Quality** Management, **Data & Method** Validation, **Mathematical Computation** for Laboratory Analysis, **Wastewater** Sampling Method, **Occupational Health & Industrial Hygiene**, **Methods Validation**, **ICP**, **Mass Spectrometry**, **Ion Chromatography**, **Instrument Calibration**, **Laboratory Management**, **GLP**, Advanced **Chemical Sampling** Techniques, Laboratory Information Management System (**LIMS**), **Chemical Potable** Water Analysis, **Gas Chromatograph Analyzer** Operation & Maintenance and **Statistical Analysis** of Laboratory Data & Method Validation.

During his career life, **Professor McCrindle** held significant positions as the **Research Professor**, **Chemistry Professor**, **Department Head**, **Chemistry & Physics Professor**, **Principal Lecturer**, **Industrial Consultant**, **Senior Instructor/Lecturer**, **Teacher** and **Laboratory Apprentice** from various international companies and institutions such as the Tshwane University of Technology, PerkinElmer, Johnson Matthey (England), LonMin (London Mining), Anglo Platinum, Impala Platinum, Technikon Pretoria and Transvaal Education Department, just to name a few. He has been associated with both the **research** and **industrial environments** for most of his professional career. With his dedication to the industry, he has been awarded **numerous awards** such as the **Spectroscopic Society's President Award**, the **Senior Researcher of the Year Award**, and **Leader of the Research Team**. He had also been the **Lead Reviewer** for **technical journals** such as the Spectrochimica Acta, the Journal of Environmental Monitoring, the Applied Spectroscopy, the Journal of Chemistry, and the Electrochemical and Solid-State Letters.

Professor McCrindle has a **PhD** in **Analytical Chemistry**, a **Master's** degree in **Physical Chemistry** and a **Bachelor's** degree in **Chemistry** and **Applied Mathematics**. Further, he is a **Certified Instructor/Trainer** and a **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**). He has further published several scientific journals and papers and has delivered numerous trainings, courses, workshops, conferences and seminars internationally.

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.

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.

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: ***Sunday, 19th of July 2026***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0915	***Introduction to Laboratory Equipment*** *Types of Laboratory Equipment (Analytical, Measuring, Support) • Equipment Classification Based on Function • Critical versus Non-Critical Equipment • Role in Research, Testing & Quality Control*
0915 – 1000	***Principles of Equipment Maintenance*** *Preventive versus Corrective Maintenance • Predictive Maintenance Concepts • Maintenance Lifecycle Management • Cost-Benefit Analysis of Maintenance*
100 – 1015	*Break*
1015 – 1115	***Laboratory Safety & Equipment Handling*** *Safe Operation Procedures • Hazard Identification (Chemical, Electrical, Mechanical) • Personal Protective Equipment (PPE) • Emergency Response Related to Equipment Failure*
1115 – 1215	***Equipment Documentation & Records*** *Equipment Logs & History Records • Standard Operating Procedures (SOPs) • Maintenance Checklists • Calibration Certificates & Traceability*

1215 – 1230	Break
1230 - 1315	***Basics of Calibration Concepts*** *Definition & Purpose of Calibration • Accuracy, Precision & Uncertainty • Traceability to Standards (ISO, NIST, etc.) • Calibration versus Verification*
1315 - 1420	***Regulatory & Quality Standards*** *ISO/IEC 17025 Requirements • Good Laboratory Practice (GLP) • FDA & GMP Considerations • Audit & Compliance Requirements*
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 One

Day 2: Monday, 20th of July 2026

0730 – 0830	***Analytical Balances Maintenance*** *Cleaning Procedures & Contamination Control • Environmental Factors (Vibration, Airflow, Temperature) • Routine Performance Checks • Troubleshooting Drift & Instability*
0830 – 0930	***pH Meters Maintenance*** *Electrode Care & Storage • Cleaning & Conditioning of Probes • Troubleshooting Calibration Issues • Temperature Compensation Handling*
0930 – 0945	Break
0945 – 1100	***Centrifuges Maintenance*** *Rotor Inspection & Balancing • Lubrication & Mechanical Checks • Safety Interlocks & Lid Operation • Preventing Wear & Corrosion*
1100 – 1215	***Microscopes Maintenance*** *Optical Cleaning Techniques • Alignment & Focusing Systems • Illumination System Maintenance • Storage & Handling Precautions*
1215 – 1230	Break
1230 – 1330	***Spectrophotometers Maintenance*** *Lamp Maintenance & Replacement • Optical Path Cleaning • Baseline Stability Checks • Software & Firmware Considerations*
1330 - 1420	***Refrigerators & Freezers*** *Temperature Monitoring & Control • Defrosting Procedures • Alarm Systems & Backup Power • Sample Storage Best Practices*
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: Tuesday, 21st of July 2026

0730 – 0830	***Calibration Fundamentals*** *Calibration Hierarchy & Standards • Measurement Uncertainty Basics • Tolerance & Acceptance Criteria • Calibration Intervals & Scheduling*
0830 – 0930	***Balance Calibration*** *Internal versus External Calibration • Use of Certified Weights • Repeatability & Linearity Tests • Environmental Influence Control*
0930 – 0945	Break
0945 – 1100	***Temperature Equipment Calibration*** *Thermometers & Temperature Probes • Calibration Baths & Dry Blocks • Multi-Point Calibration Techniques • Recording & Interpreting Results*

1100 – 1215	***Volume Measurement Calibration*** *Pipettes & Burettes Calibration • Gravimetric Method • Air Displacement versus Positive Displacement • Error Sources & Corrections*
1215 – 1230	*Break*
1230 – 1330	***Pressure & Vacuum Calibration*** *Pressure Gauges & Sensors • Deadweight Testers • Leak Testing Procedures • Calibration Documentation*
1330 - 1420	***Electrical Equipment Calibration*** *Multimeters & Oscilloscopes • Signal Generators • Calibration of Voltage/Current • Safety Considerations in Electrical Calibration*
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: ***Wednesday, 22nd of July 2026***

0730 – 0830	***Preventive Maintenance Programs*** *Scheduling & Planning Maintenance • Maintenance Management Systems (CMMS) • Spare Parts Management • Documentation & Reporting*
0830 – 0930	***Troubleshooting Laboratory Equipment*** *Root Cause Analysis Techniques • Common Equipment Failures • Diagnostic Tools & Methods • Case Studies*
0930 – 0945	*Break*
0945 – 1100	***Equipment Qualification & Validation*** *Installation Qualification (IQ) • Operational Qualification (OQ) • Performance Qualification (PQ) • Requalification Procedures*
1100 – 1215	***Environmental Control in Laboratories*** *Temperature & Humidity Monitoring • Cleanroom Requirements • Airflow & Contamination Control • Impact on Equipment Performance*
1215 – 1230	*Break*
1230 – 1330	***Software & Digital Systems Maintenance*** *Firmware Updates & Patches • Data Integrity & Backup • Cybersecurity Considerations • Instrument Software Validation*
1330 - 1420	***Risk Management in Equipment Maintenance*** *Risk Assessment Methodologies (FMEA) • Criticality Assessment • Mitigation Strategies • Continuous Improvement Practices*
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 Four*

Day 5: ***Thursday, 23rd of July 2026***

0730 – 0830	***Quality Assurance in Calibration*** *Quality Control Checks • Inter-Laboratory Comparisons • Proficiency Testing • Calibration Traceability*
0830 – 0930	***Audit Preparation & Compliance*** *Internal versus External Audits • Documentation Review • Common Audit Findings • Corrective & Preventive Actions (CAPA)*
0930 – 0945	*Break*

0945 – 1100	***Calibration Certificates & Reporting*** *Key Elements of Calibration Reports • Measurement Uncertainty Reporting • Acceptance Criteria Documentation • Record Retention Policies*
1100 – 1215	***Equipment Lifecycle Management*** *Procurement & Installation • Usage & Maintenance • Decommissioning Procedures • Cost Optimization Strategies*
1215 – 1230	*Break*
1230 – 1315	***Best Practices in Laboratory Maintenance*** *Standardization of Procedures • Training & Competency Development • Continuous Monitoring & Improvement • Benchmarking & Performance Metrics*
1230 – 1315	***Future Trends in Laboratory Equipment*** *Automation & Smart Labs • IoT-Enabled Equipment Monitoring • Remote Calibration Technologies • AI in Predictive Maintenance*
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/Lab Visit

Lab Site visit will be organized during the course for delegates to practice the theory learnt:-

Course Coordinator

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