



COURSE OVERVIEW IE1116

Smart Gas Metering Skids & Advanced Measurement Technologies

Course Title

Smart Gas Metering Skids & Advanced Measurement Technologies

Course Date/Venue

November 23-27, 2025/Club Rotana Meeting Room, City Centre Rotana, Doha, Qatar

Course Reference

IE1116

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 Smart Gas Metering Skids & Advanced Measurement Technologies. It covers the importance of accurate gas measurement, gas flow properties, types of gases in the industry and applications in custody transfer and process control; the basic principles of fluid flow, components of gas metering skids and types of gas meters; the gas flow measurement standards, smart metering concepts, ultrasonic flow meters, coriolis flow meters and turbine and rotary meters; and the pressure and temperature compensation, gas chromatography in skid systems, flow computers and data acquisition.



Further, the course will also discuss the skid fabrication and layout design, control panel and SCADA integration; the power supply and electrical design; the smart communication technologies and calibration and validation procedures; the routine operation of gas metering skids and common troubleshooting scenarios; and the predictive and preventive maintenance, diagnostic tools and remote monitoring and safety in gas metering operations.



During this interactive course, participants will learn the legal requirements for custody transfer, approval of measuring systems, role of third-party verification and penalties for metering inaccuracies; the gross calorific value (GCV) determination, correction factors and calculation methods and invoice generation and audit trails; the ISO 17025 calibration lab requirements, MID compliance and API/AGA reporting requirements; the concept of digital twins for metering skids and AI for anomaly detection, predictive maintenance through ML models and future integration with blockchain for billing; the planning and specification phase and vendor selection; and the technical bid evaluation, installation and commissioning management and risk mitigation and project handover.

Course Objectives

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

- Apply and gain an in-depth knowledge on smart gas metering skids and advanced measurement technologies
- Discuss the importance of accurate gas measurement, gas flow properties, types of gases in the industry and applications in custody transfer and process control
- Recognize the basic principles of fluid flow, components of gas metering skids and types of gas meters
- Review gas flow measurement standards, smart metering concepts, ultrasonic flow meters, coriolis flow meters and turbine and rotary meters
- Recognize pressure and temperature compensation, gas chromatography in skid systems, flow computers and data acquisition
- Illustrate skid fabrication and layout design, control panel and SCADA integration, as well as power supply and electrical design, power supply and electrical design
- Discuss smart communication technologies and apply calibration and validation procedures, routine operation of gas metering skids and common troubleshooting scenarios
- Employ predictive and preventive maintenance, diagnostic tools and remote monitoring and safety in gas metering operations
- Explain the legal requirements for custody transfer, approval of measuring systems, role of third-party verification and penalties for metering inaccuracies
- Apply gross calorific value (GCV) determination, correction factors and calculation methods and invoice generation and audit trails
- Identify ISO 17025 calibration lab requirements, MID compliance and API/AGA reporting requirements
- Discuss the concept of digital twins for metering skids and apply AI for anomaly detection, predictive maintenance through ML models and future integration with blockchain for billing
- Describe planning and specification phase and apply vendor selection and technical bid evaluation, installation and commissioning management and risk mitigation and project handover

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 smart gas metering skids and advanced measurement technologies for instrumentation & control engineers, measurement engineers & technicians, process engineers, operations & maintenance personnel, gas transmission & distribution engineers, SCADA & automation engineers, project & engineering managers, regulatory compliance & QA/QC professionals, procurement specialists (technical), consultants & EPC contractors

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:

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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.

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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. Mahmoud Fattah, is a **Senior Instrumentation & Control Engineer** with over **30 years** of extensive experience within the **Oil & Gas, Petrochemical and Gas Metering, Gas Metering Skids, Gas Flow Measurement Standards, Pressure & Temperature Compensation, Smart Communication Technologies, Custody Transfer, Digital Twin & AI in Metering**, Fertilizer industries. His expertise widely covers the **Analyzer Theory Operations and Maintenance, Process Control Loop, Control Valves, Control Systems, Actuators & Valve Selection, Process Control & Automation, Batch Process & Sequential Control, Analog Control, Operator Interfaces, Data Communication, System Checkout & Testing, Advanced Control with PLC's, Ladder Logic, Process Instrumentation & Control, Control Valve Maintenance, Process Automation & Control Instrumentation, Foxboro, ABB, Rosemount, Yokogawa, Pneumatic & Electronic, Level Measurement, Pressure Measurement, Temperature & Flow Measurement, Actuators & Positioners, Control Room Instruments, Panel Controllers, Indicators & Recorders, Control Systems Installation, Control Valves Maintenance, Analytical Analyzers, Transmitters, Controllers, Smart Instruments and PLC & PID Control**. Further, he is also well-versed in **Turbine, Pumps & Compressors, Pump Maintenance & Water Tanks, Turbines & Generators, Pressure Switch & Gauge Cabinet Calibration, Lube/Seal Oil Control System and Hydrogen Generation**.

During his career life, Mr. Fattah has gained his practical and field experience through his various significant positions and dedication as the **General Manager, Technical Director, Technical Officer, Process Field & Panel Instruments, Maintenance Director, Maintenance Engineer, Instrumentation Engineer, Technical Officer, Instrument Specialist, Instrument Expert/Trainer, Instructor/Trainer** for El Mansourah Main Water Plant, SEMADCO, Creol Production Service International (CPSI), Saudi Consilidated Electric Co. (SCECO), Delta Co., General Fertilizer Company (GFC) and International Expertise Association (INTEX).

Mr. Fattah has a **Bachelor** degree in **Mechanical Power Engineering**. Further, he is a **Certified Instructor/Trainer**, an active member of Egyptian Engineering Syndicate and delivered numerous trainings, courses, workshops, conferences and seminars internationally.

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\$ 6,000 per Delegate. 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 workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: Sunday, 23rd of November 2025

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	PRE-TEST
0830 – 0930	Introduction to Natural Gas Metering Importance of Accurate Gas Measurement • Overview of Gas Flow Properties • Types of Gases in the Industry • Applications in Custody Transfer and Process Control
0930 – 0945	Break
0945 – 1030	Basic Principles of Fluid Flow Flow Regimes: Laminar vs. Turbulent • Reynolds Number and Its Significance • Pressure, Temperature, and Density Relations • Compressibility Factors in Gases
1030 – 1130	Components of Gas Metering Skids Piping and Valves • Pressure Regulators and Filters • Flow Conditioners and Strainer Elements • Isolation and Bypass Systems
1130 – 1215	Types of Gas Meters Orifice Plate Meters • Ultrasonic Flow Meters • Turbine Meters • Coriolis and Thermal Mass Flow Meters
1215 – 1230	Break
1230 – 1330	Gas Flow Measurement Standards AGA (American Gas Association) Standards • ISO 5167 and ISO 6976 • API MPMS Standards • OIML and Other Metrological Guidelines
1330 – 1420	Basics of Smart Metering Concepts Definition of Smart Metering • Key Differences from Conventional Metering • Digital Integration and Remote Monitoring • Benefits in Terms of OPEX and Data Availability
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, 24th of November 2025

0730 – 0830	Ultrasonic Flow Meters Principle of Operation (Transit Time, Doppler) • Inline vs. Clamp-On Meters • Accuracy and Calibration Requirements • Diagnostic Capabilities and Self-Checks
0830 – 0930	Coriolis Flow Meters Mass Flow Measurement Principle • Installation Requirements • Density and Temperature Measurement • Performance in Multiphase Flow
0930 – 0945	Break



0945 – 1100	Turbine & Rotary Meters Design and Operational Principles • Advantages and Limitations • Bearings and Rotor Behavior • Maintenance and Lifecycle Cost
1100 – 1215	Pressure & Temperature Compensation Real Gas Behavior • Integration with RTD and Pressure Transmitters • Smart Transmitters (HART, Foundation Fieldbus) • Compensation Algorithms and Implementation
1215 – 1230	Break
1230 – 1330	Gas Chromatography in Skid Systems Role of GC in Quality Measurement • Composition Analysis for Energy Content • Integration with Flow Computers • Calibration and Sample Conditioning
1330 – 1420	Flow Computers & Data Acquisition Key Functions of Flow Computers • Connectivity with Sensors and Meters • Real-Time Logging and Trending • Protocols: Modbus, Profibus, OPC
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, 25th of November 2025

0730 – 0830	Skid Fabrication & Layout Design Skid Piping Layout and Footprint Optimization • Materials Selection (Piping, Instruments) • Skid Frame and Structural Considerations • Accessibility and Maintainability
0830 – 0930	Control Panel & SCADA Integration PLC/DCS Integration • Remote Terminal Units (RTU) • Human-Machine Interface (HMI) • Alarm and Shutdown Systems
0930 – 0945	Break
0945 – 1100	Power Supply & Electrical Design Power Requirements for Instruments • Hazardous Area Classifications (ATEX, IECEx) • Cabling and Junction Box Layouts • UPS and Battery Backup Systems
1100 – 1215	Smart Communication Technologies IoT and IIoT for Gas Metering • Wireless Communication (NB-IoT, LoRaWAN) • Edge Computing in Smart Skids • Cybersecurity Considerations
1215 – 1230	Break
1230 – 1330	Calibration & Validation Procedures Factory Acceptance Tests (FAT) • Site Acceptance Tests (SAT) • Meter Proving Techniques • Verification Frequency and Traceability
1330 – 1420	Case Study: Integrated Smart Metering Skid Process Flow and Block Diagram Review • Discussion of Selected Instruments • Challenges and Optimization • Q&A and Lessons Learned
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, 26th of November 2025

0730 – 0830	Routine Operation of Gas Metering Skids Startup and Shutdown Procedures • Reading and Interpreting Flow Data • Checking for Abnormal Conditions • Operational Best Practices
0830 – 0930	Common Troubleshooting Scenarios Zero Drift and Signal Loss • Pressure Drops and Gas Surges • Communication Failures • False Readings or Alarms
0930 – 0945	Break
0945 – 1100	Predictive & Preventive Maintenance Scheduled Inspection Routines • Cleaning of Filters and Sensors • Trending Meter Performance Data • Preventing Calibration Drift
1100 – 1215	Diagnostic Tools & Remote Monitoring Use of Diagnostic Dashboards • Embedded Diagnostics in Smart Meters • Remote Analytics via Cloud Platforms • Predictive Alerts and Asset Health Index
1215 – 1230	Break
1230 – 1330	Safety in Gas Metering Operations Handling Pressurized Systems • Gas Leak Detection Systems • Fire/Explosion Protection Strategies • Emergency Response Protocols
1330 – 1420	Hands-On Exercise or Simulation Walkthrough of a Smart Metering SCADA • Live Data Interpretation • Alarm Condition Diagnosis • Parameter Configuration Exercise
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, 27th of November 2025

0730 – 0830	Custody Transfer & Legal Metrology Legal Requirements for Custody Transfer • Approval of Measuring Systems • Role of Third-Party Verification • Penalties for Metering Inaccuracies
0830 – 0930	Energy Billing & Gas Quality Calculations Energy vs. Volume Billing • Gross Calorific Value (GCV) Determination • Correction Factors and Calculation Methods • Invoice Generation and Audit Trails
0930 – 0945	Break
0945 – 1100	Regulatory Standards & Certification ISO 17025 Calibration Lab Requirements • MID Compliance (EU Measuring Instruments Directive) • API/AGA Reporting Requirements • Certifying Authorities and Periodic Audits
1100 – 1215	Digital Twin & AI in Metering Concept of Digital Twins for Metering Skids • Use of AI for Anomaly Detection • Predictive Maintenance through ML Models • Future Integration with Blockchain for Billing
1215 – 1230	Break
1230 – 1345	Project Planning & Execution of Metering Systems Planning & Specification Phase • Vendor Selection and Technical Bid Evaluation • Installation & Commissioning Management • Risk Mitigation and Project Handover



1345 – 1400	Course Conclusion Using this Course Overview, the Instructor(s) will Brief Participants about Topics that were Covered During the Course
1400 – 1415	POST-TEST
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

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 “Gas Ultrasonic Meter Sizing Tool”, “Liquid Turbine Meter and Control Valve Sizing Tool”, “Liquid Ultrasonic Meter Sizing Tool” and “Orifice Flow Calculator” simulators.



Gas Ultrasonic Meter (USM) Sizing Tool Simulator



Liquid Turbine Meter and Control Valve Sizing Tool Simulator



Liquid Ultrasonic Meter Sizing Tool Simulator



Orifice Flow Calculator Simulator

Course Coordinator

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