COURSE OVERVIEW FE1021
Materials & Testing Foundation

Course Title
Materials & Testing Foundation

Course Date/Venue
Please refer to page 3

Course Reference
FE1021

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 Materials & Testing Foundation. It covers the materials engineering in oil and gas, classification of engineering materials, mechanical and physical properties of materials and material degradation mechanisms; the materials testing, tensile testing, hardness testing, impact testing, fatigue testing, creep testing and bend and flexural testing; and the NDT methods, visual testing (VT), ultrasonic testing (UT), radiographic testing (RT), magnetic particle testing (MPT) and liquid penetrant testing (LPT).

Further, the course will also discuss the crystal structures (BCC, FCC, HCP), grain size and boundaries; the solidification and phase transformation and alloying elements and effects; the heat treatment of metals, annealing, normalizing, quenching, tempering and precipitation hardening; the heat-affected zone (HAZ), welding defects and causes, post-weld heat treatment (PWHT) and welding metallurgy and material compatibility; the corrosion mechanisms and testing, uniform corrosion, pitting and crevice corrosion; and the stress corrosion cracking and corrosion testing methods.

During this interactive course, participants will learn the material selection criteria, service temperature and pressure, corrosive environment resistance, mechanical property requirements and economic and availability considerations; the industry standards and codes, ASTM material testing standards, ASME material specifications, ISO quality management in materials testing and API standards for oil and gas materials; the material certification and traceability and quality control in materials testing; and the failure analysis procedures and laboratory safety in materials testing.

Course Objectives

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

- Apply and gain a basic knowledge on materials and testing foundation
- Discuss materials engineering in oil and gas including classification of engineering materials, mechanical and physical properties of materials and material degradation mechanisms
- Carryout materials testing, tensile testing, hardness testing, impact testing, fatigue testing, creep testing and bend and flexural testing
- Employ NDT methods, visual testing (VT), ultrasonic testing (UT), radiographic testing (RT), magnetic particle testing (MPT) and liquid penetrant testing (LPT)
- Identify crystal structures (BCC, FCC, HCP), grain size and boundaries, solidification and phase transformation and alloying elements and effects
- Apply heat treatment of metals including annealing, normalizing, quenching and tempering and precipitation hardening
- Recognize heat-affected zone (HAZ), welding defects and causes, post-weld heat treatment (PWHT) and welding metallurgy and material compatibility
- Carryout corrosion mechanisms and testing covering uniform corrosion, pitting and crevice corrosion, stress corrosion cracking and corrosion testing methods
- Apply material selection criteria comprising of service temperature and pressure, corrosive environment resistance, mechanical property requirements and economic and availability considerations
- Discuss industry standards and codes covering ASTM material testing standards, ASME material specifications, ISO quality management in materials testing and API standards for oil and gas materials
- Review material certification and traceability and apply quality control in materials testing, failure analysis procedures and laboratory safety in materials testing

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 materials and testing foundation for project managers, construction supervisors, civil engineers, geotechnical engineers, site engineers, technical inspectors, project coordinators, quality control / quality assurance (QC/QA) technicians, laboratory technicians and other technical staff.

Course Date/Venue

Session(s)	Date	Venue
1	September 14-18, 2025	Meeting Plus 9, City Centre Rotana, Doha, Qatar
2	October 19-23, 2025	Crowne Meeting Room, Crowne Plaza Al Khobar, an IHG Hotel, Al Khobar, KSA
3	November 17-21, 2025	Ajman Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
4	December 21-25, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

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 Fee

Doha	**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.
Al Khobar/ Abu Dhabi/Dubai	**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.

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. George Poulos, MBA, MSc, BSc, CEng, is a **Senior Corrosion & Metallurgical Engineer** with over **30 years** of extensive experience within the **Oil & Gas, Petrochemical, Refinery, Construction, Aircraft & Shipbuilding** Industry. His wide experiences cover in the areas of **Pressure Vessels**, **Piping Inspection**, **Risk-Based Inspection**, **Fitness-for-Service** (**FFS**), **Metallurgical** Failure, **Metallurgy & Metallurgical Processes, Metallurgical** Lab, Corrosion and **Metallurgy**, Analysis & Prevention, **Corrosion** Fabrication & Inspection, **Fabrication** & **Repair**, **Corrosion** Prevention, **Corrosion** Engineering, **Corrosion Control**, **Corrosion Inhibition**, **Corrosion** Management in Process Operations, **Corrosion** & Prevention of Failures, **Material** Selection & Properties, **Material & Inspection** Foundation **Cathodic Protection** Systems, **Steel Metallurgy**, **Steel** Structure Welding, **Steelmaking** Slag, **Steel** Making Application, **Steel Making** Process, **Steel** Manufacturing, **Steel Forging**, **Steel** Manufacturing & Process Troubleshooting, **Hot Rolling** Process, **Hot Strip Mill**, **Mill** Operations, **Roll Mill**, **Electric Arc Furnace** (**EAF**), **Slit Rolling**, **Carbon Steel Pipe** Wall Thickness & Grade Selection, **Ferro-Alloys**, **Heat Treatment** & **Prevention Techniques** and **Post Weld Heat Treatment**. Further, he is also well-versed in **Welding** Inspection, **Welding** & **Machine** Techniques, **TIG** & **Arc Welding**, **Shielded Metal Arc Welding**, **Gas Tungsten** & **Gas Metal Arc Welding**, **Welding** Procedure Specifications & Qualifications, **Aluminium Welding**, **Hot Work-Safety**, **SMAW**, **GTAW**, **Welding** Techniques, **Pipeline Welding** Practices, **Welding** Engineering, **Welding** Fatigue & Fracture Mechanics, **Welding Inspection Technology**, **Welding Safety**, **Welding** Defects Analysis, **Welding Technology**, **Welding Problems**, **Welding & Non Destructive** Testing and **Metallurgy Techniques**.

During his career life, Mr. Poulos has gained his practical and field experience through his various significant positions and dedication as the **Chief Executive**, **Head of Technical Studies**, **Manager**, **Senior Consultant**, **Lead Welding Engineer**, **Senior Welding Engineer**, **Design Engineer**, **Sales Engineer**, **Author**, **Welding Instructor**, **Visiting Lecturer** and **Technical Proposal Research Evaluator** from various international companies such as Greek Welding Institute, Hellenic Quality Forum and International Construction Companies such as Shipbuilding, Aircraft Industry and Oil and Gas Industry.

Mr. Poulos is a **Registered Chartered Engineer** and has a **Master's** degree in **Naval Architecture**, a **Bachelor's** degree in **Welding Engineering** and a Master of Business Administration (**MBA**) from the **Sunderland University**, **Aston University** and **Open University**, **UK**, respectively. Further, he is a **Certified Trainer/Instructor**, an active Member of Chartered Quality Institute (**CQI**), The British Welding Institute (**TWI**), The Royal Institution of Naval Architects (**RINA**) and American Welding Society (**AWS**), a Registered **EWF/IW** (European Welding Federation-International Welding Institute W/E) and an **IRCA** Accredited External Quality Systems Auditor through BVQI. He is an **Author** of Technical Book dealing with Protection/Health/Safety in the Welding/Cutting domain and delivered various trainings, seminars, conferences, workshops and courses globally.

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	***Overview of Materials Engineering in Oil & Gas*** *Role of Materials in Operations • Common Engineering Materials Used in Refineries • Relationship Between Design, Materials & Safety • Lifecycle Considerations in Material Selection*
0930 – 0945	*Break*
0945 – 1030	***Classification of Engineering Materials*** *Metals, Non-Metals & Composites • Ferrous versus Non-Ferrous Metals • Polymers, Ceramics & Advanced Materials • Applications in Industrial Environments*
1030 – 1130	***Mechanical Properties of Materials*** *Strength & Hardness • Ductility & Brittleness • Elasticity & Plasticity • Toughness & Resilience*
1130 – 1215	***Physical Properties of Materials*** *Density & Specific Gravity • Thermal Conductivity & Expansion • Electrical Conductivity & Resistivity • Magnetic Properties*
1215 – 1230	*Break*
1230 – 1330	***Material Degradation Mechanisms*** *Corrosion Basics & Types • Wear & Abrasion • Fatigue & Creep • Environmental Effects (Temperature, Humidity, Chemicals)*
1330 – 1420	***Basics of Materials Testing*** *Purpose & Importance of Testing • Destructive versus Non-Destructive Testing • Laboratory versus Field Testing • Standards & Compliance (ASTM, ISO, ASME)*
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

0730 – 0830	***Tensile Testing*** *Purpose & Principles • Stress-Strain Curves • Yield Strength & Ultimate Tensile Strength • Elongation & Reduction of Area*
0830 – 0930	***Hardness Testing*** *Brinell Hardness Test • Rockwell Hardness Test • Vickers Hardness Test • Conversion Between Hardness Scales*
0930 – 0945	*Break*
0945 – 1100	***Impact Testing*** *Charpy & Izod Methods • Energy Absorption Concepts • Notch Sensitivity • Test Specimen Preparation*

1100 – 1230	***Fatigue Testing*** *Fatigue Life Curves (S-N Curves) • Low-Cycle versus High-Cycle Fatigue • Crack Initiation & Propagation • Fatigue in Oil & Gas Applications*
1230 – 1245	*Break*
1245 – 1330	***Creep Testing*** *Definition & Importance • Primary, Secondary & Tertiary Creep • Factors Affecting Creep Resistance • Creep Testing Equipment*
1330 – 1345	***Bend & Flexural Testing*** *Purpose of Bend Testing • Three-Point & Four-Point Bending • Measuring Flexural Modulus • Applications in Piping & Structural Materials*
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

0730 – 0830	***NDT Methods*** *Benefits Over Destructive Testing • Surface versus Volumetric Inspection • Cost & Time Considerations • Typical Applications in Refinery Operations*
0830 – 0930	***Visual Testing (VT)*** *Direct & Remote Visual Inspection • Use of Borescopes & Endoscopes • Surface Defect Identification • Acceptance Criteria*
0930 – 0945	*Break*
0945 – 1100	***Ultrasonic Testing (UT)*** *Basic Principles & Sound Wave Propagation • Pulse-Echo Method • Thickness Measurement • Defect Characterization*
1100 – 1230	***Radiographic Testing (RT)*** *X-Ray & Gamma-Ray Sources • Film versus Digital Radiography • Interpreting Radiographs • Radiation Safety Precautions*
1230 – 1245	*Break*
1245 – 1330	***Magnetic Particle Testing (MPT)*** *Magnetic Field Application • Wet versus Dry Methods • Fluorescent Magnetic Particles • Defect Interpretation*
1330 – 1345	***Liquid Penetrant Testing (LPT)*** *Surface Preparation • Application of Penetrant & Developer • Inspection Under Visible & UV Light • Limitations of LPT*
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

0730 – 0830	***Basic Metallurgy Concepts*** *Crystal Structures (BCC, FCC, HCP) • Grain Size & Boundaries • Solidification & Phase Transformation • Alloying Elements & Effects*
0830 – 0930	***Heat Treatment of Metals*** *Annealing • Normalizing • Quenching & Tempering • Precipitation Hardening*
0930 – 0945	*Break*

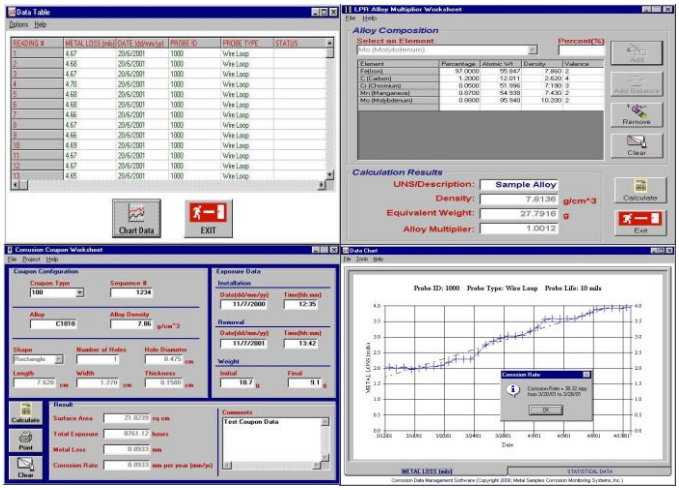
0945 – 1100	***Welding Metallurgy*** *Heat-Affected Zone (HAZ) • Welding Defects & Causes • Post-Weld Heat Treatment (PWHT) • Welding Metallurgy & Material Compatibility*
1100 – 1230	***Corrosion Mechanisms & Testing*** *Uniform Corrosion • Pitting & Crevice Corrosion • Stress Corrosion Cracking • Corrosion Testing Methods*
1230 – 1245	*Break*
1245 – 1330	***Material Selection Criteria*** *Service Temperature & Pressure • Corrosive Environment Resistance • Mechanical Property Requirements • Economic & Availability Considerations*
1330 – 1345	***Case Studies in Refinery Material Failures*** *Common Failure Modes in Refinery Equipment • Lessons Learned from Industry Incidents • Root Cause Analysis Methods • Preventive Measures*
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

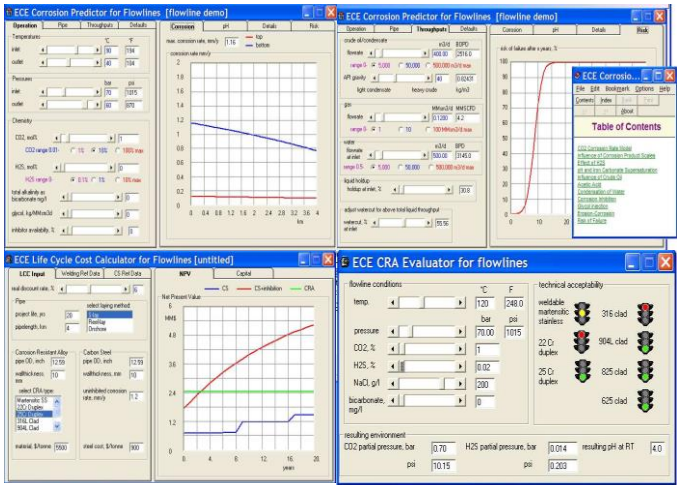
0730 – 0830	***Industry Standards & Codes*** *ASTM Material Testing Standards • ASME Material Specifications • ISO Quality Management in Materials Testing • API Standards for Oil & Gas Materials*
0830 – 0930	***Material Certification & Traceability*** *Mill Test Certificates (MTC) • Heat Numbers & Batch Identification • Traceability Requirements in Refinery Projects • Supplier Quality Verification*
0930 – 0945	*Break*
0945 - 1100	***Quality Control in Materials Testing*** *Calibration of Testing Equipment • Test Procedure Qualification • Sample Preparation & Handling • Documentation & Reporting*
1100 – 1230	***Failure Analysis Procedures*** *Gathering Background Data • Visual Examination • Laboratory Analysis Techniques • Reporting & Recommendations*
1230 – 1245	*Break*
1245 – 1315	***Laboratory Safety in Materials Testing*** *Handling of Hazardous Materials • Safe Use of Testing Equipment • PPE Requirements • Emergency Procedures*
1315 - 1345	***Practical Workshop & Course Review*** *Hands-On Testing Demonstrations • Interpretation of Test Results • Group Discussion & Problem-Solving*
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*

Simulator (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 the simulators "Corrosion Data Management Software (CDMS)" and "Electronic Corrosion Engineer (ECE®) 5".



Corrosion Data Management Software (CDMS)



Electronic Corrosion Engineer (ECE®) 5

Course Coordinator

Reem Dergham, Tel: +974 4423 1327, Email: reem@haward.org