COURSE OVERVIEW FE1023
Mechanical Testing of Metals

Course Title
Mechanical Testing of Metals

Course Date/Venue
Please see page 3

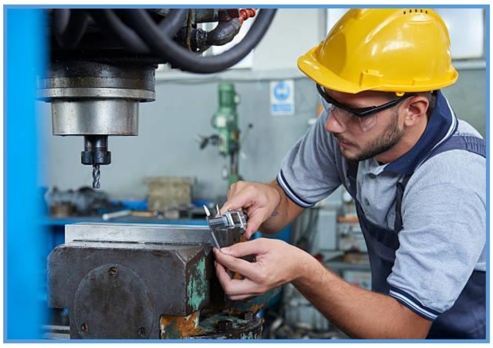
Course Reference
FE1023

3.0 CEUs (30 PDHs) AWARD

H-STK© INCLUDED

Course Duration/Credits
Five days/3.0 CEUs/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.

This course is designed to provide participants with a detailed and up-to-date overview of Mechanical Testing of Metals. It covers the role of mechanical testing in quality control and material certification; the material properties and their significance, mechanical tests classification and stress-strain fundamentals; the specimen preparation for testing, standards and testing protocols and tensile test applications; the tensile test equipment and setup, tensile test data interpretation and compression testing of metals; and the compression test analysis, hardness testing fundamentals and Brinell and Rockwell hardness test.

During this interactive course, participants will learn the Vickers and microhardness testing, impact testing, fracture appearance and ductile-brittle transition; the fatigue testing basics, fatigue test procedures and fatigue crack growth analysis; the creep testing and interpretation, combined fatigue and creep considerations; the fracture toughness testing, non-standard and specialized mechanical tests and data acquisition and analysis; linking test results to root cause analysis and the metallography and fractography correlation and predictive maintenance; the structure of mechanical test reports and interpretation for design and maintenance teams; and archiving test records for traceability.

Course Objectives

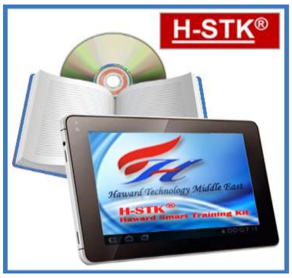
Upon the successful completion of this course, each participant will be able to:-

- Apply and gain in depth knowledge on mechanical testing of metals
- Discuss the role of mechanical testing in quality control and material certification
- Recognize material properties and their significance, classify mechanical tests and discuss stress-strain fundamentals
- Carryout specimen preparation for testing, standards and testing protocols and tensile test applications
- Employ tensile test equipment and setup, tensile test data interpretation and compression testing of metals
- Apply compression test analysis, hardness testing fundamentals and Brinell and Rockwell hardness test
- Illustrate Vickers and microhardness testing, impact testing, fracture appearance and ductile-brittle transition
- Apply fatigue testing basics, fatigue test procedures and fatigue crack growth analysis
- Employ creep testing and interpretation and discuss combined fatigue and creep considerations
- Carryout fracture toughness testing, non-standard and specialized mechanical tests and data acquisition and analysis
- Link test results to root cause analysis and describe metallography and fractography correlation and predictive maintenance
- Discuss the structure of mechanical test reports and interpretation for design and maintenance teams as well as archive test records for traceability

Who Should Attend

This course provides an overview of all significant aspects and considerations of mechanical testing of metals for mechanical and materials engineers, quality assurance and quality control personnel, laboratory technicians, production and process engineers, metallurgists and material scientists, inspectors and auditors, engineering managers and supervisors.

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**.*

Course Date/Venue

Session(s)	Date	Venue
1	September 21-25, 2025	Crowne Meeting Room, Crowne Plaza Al Khobar, an IHG Hotel, Al Khobar, KSA
2	October 26-30, 2025	Safir Meeting Room, Divan Istanbul, Taksim, Turkey
3	November 23-27, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
4	December 08-12, 2025	Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, 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

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.
Istanbul	**US$ 6,000** 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)

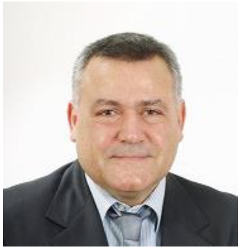
  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** 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:



Dr. Tony Dimitry, PhD, MSc, BSc, is a **Senior Corrosion & Metallurgical Engineer** with over **30 years** of industrial experience. His expertise covers **Corrosion** Prevention, **Cathodic Protection** Systems, **Corrosion Control**, **Corrosion Inhibition**, **Corrosion** Management in Process Operations, **Corrosion** Engineering, **Metallurgical** Failure Analysis & Prevention, **Fabrication & Repair**, **Corrosion** & Prevention of Failures, **Material** Selection, **Welding** Technology, **Welding Defects** Analysis, **Brazing/Soldering**, **Steel Manufacturing**, **Facility Integrity**, **Ladle Furnace Treatment**, **Ferro-Alloys Production**, **Tank Farm & Tank Terminal Safety**, Integrity Management, Fitness-for-Service (**FFS**), Process Plant Equipment, **Pressure Vessels**, **Piping & Storage Facilities**, Piping **Vibration** Analysis & Practical Engineering Solutions, Remaining Life Assessment & Repair of **Pressure Equipment & Piping**, **Pipeline** Operations & Maintenance, Gas Transportation Piping Code, **Maintenance** Management, **Reliability** Management, **Rotating Equipment**, **Static Equipment**, **Failure Analysis**, **FMEA** and **Preventive & Predictive** Maintenance. Currently, he is in charge of the **metallurgical failure analysis** and the usage of fracture mechanics for determining crack propagation in impellers of turbines.

During his career life, Dr. Dimitry held a significant position such as the **Operations Engineers**, **Technical Trainer**, **HSE Contracts Engineer**, **Boilers Section Engineer**, **Senior Engineer**, **Trainee Mechanical Engineer**, **Engineer**, **Turbines Section Head**, **Professor**, **Lecturer/Instructor** and **Teaching Assistant** from various multinational companies like **Chloride Silent Power Ltd.**, **Technical University of Crete**, **National Nuclear Corporation**, **UMIST Aliveri Power Station** and **HFO Fired Power Station**.

Dr. Dimitry has **PhD**, **Master** and **Bachelor** degrees in **Mechanical Engineering** from the **Victory University of Manchester** and the **University of Newcastle**, **UK** respectively. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and an associate member of the American Society of Mechanical Engineers (**ASME**) and Institution of Mechanical Engineers (**IMechE**). He has further delivered various trainings, seminars, courses, workshops and conferences internationally.

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 Mechanical Testing of Metals*** *Importance in Metallurgical Engineering and Industry • Role in Quality Control and Material Certification • Relation to Material Properties and Design Requirements • Standards and Specifications Overview (ASTM, ISO, EN)*
0930 – 0945	*Break*
0945 – 1030	***Material Properties & Their Significance*** *Mechanical versus Physical Properties • Strength, Ductility, Toughness, Hardness Definitions • Elastic versus Plastic Deformation • Influence of Microstructure*
1030 – 1130	***Classification of Mechanical Tests*** *Destructive versus Non-Destructive Tests • Static versus Dynamic Tests • Laboratory versus In-Situ Testing • Examples of Each Category*
1130 – 1215	***Stress-Strain Fundamentals*** *Concepts of Stress and Strain • Elastic Limit, Yield Point and Ultimate Strength • Modulus of Elasticity and Resilience • True Stress versus Engineering Stress*
1215 – 1230	*Break*
1230 – 1330	***Specimen Preparation for Testing*** *Sample Size and Geometry Requirements • Surface Finish and Edge Conditions • Avoiding Residual Stresses During Preparation • Influence of Specimen Orientation*
1330 – 1420	***Standards & Testing Protocols*** *ASTM E8/E8M for Tensile Testing • ASTM E18 for Hardness Testing • ISO 6892 for Metals Testing • Calibration and Verification of Test Machines*
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 Test Principles*** *Test Objectives and Applications • Load Application Methods • Measuring Elongation and Reduction in Area • Failure Modes in Tensile Tests*
0830 – 0930	***Tensile Test Equipment & Setup*** *Universal Testing Machine Components • Gripping Methods (Wedge, Hydraulic, Threaded) • Extensometers and Strain Measurement Devices • Load Cell Calibration*
0930 – 0945	*Break*
0945 – 1100	***Tensile Test Data Interpretation*** *Stress-Strain Curve Analysis • Determination of Yield Strength and Tensile Strength • Ductility and Toughness Assessment • Work Hardening Behavior*

1100 – 1230	***Compression Testing of Metals*** *Principles and Applications • Load Application and Specimen Shapes • Differences from Tensile Testing • Typical Materials Tested in Compression*
1230 – 1245	*Break*
1245 – 1330	***Compression Test Analysis*** *Stress-Strain Relationships in Compression • Buckling and Barreling Phenomena • Influence of Strain Rate • Material Anisotropy Effects*
1330 – 1345	***Case Studies in Tensile & Compression Testing*** *Examples from Refinery and Petrochemical Industries • Common Test Failures and Troubleshooting • Quality Acceptance Criteria • Lessons Learned from Field Experience*
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	***Hardness Testing Fundamentals*** *Definition and Significance • Relationship to Strength and Wear Resistance • Static versus Dynamic Hardness Tests • Limitations of Hardness Testing*
0830 – 0930	***Brinell Hardness Test*** *Principle and Applications • Indenter Types and Load Selection • Reading and Calculating Hardness Values • ASTM E10 Standard Requirements*
0930 – 0945	*Break*
0945 – 1100	***Rockwell Hardness Test*** *Principle and Scale Selection (A, B, C) • Major versus Minor Loads • Reading Dial/Gauge Results • ASTM E18 Compliance*
1100 – 1230	***Vickers & Microhardness Testing*** *Principle and Applications • Suitable Materials and Thin Sections • Optical Measurement of Indentations • ASTM E384 Standard Requirements*
1230 – 1245	*Break*
1245 – 1330	***Impact Testing – Charpy & Izod*** *Purpose and Importance in Brittle Fracture Analysis • Specimen Preparation and Notch Geometry • Energy Absorption Measurement • ASTM E23 and ISO 148 Standards*
1330 – 1345	***Fracture Appearance & Ductile-Brittle Transition*** *Fracture Surface Observation • Temperature Effects on Toughness • Transition Temperature Evaluation • Implications for Refinery Metal Selection*
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	***Fatigue Testing Basics*** *Definition of Fatigue Failure • High-Cycle versus Low-Cycle Fatigue • Stress-Life (S-N) Curves • Refinery Equipment Fatigue Considerations*
0830 – 0930	***Fatigue Test Procedures*** *Rotating Bending, Axial Loading, Torsion Tests • Load Ratio and Mean Stress Effects • Environmental Influences on Fatigue Life • ASTM E466 Standard Requirements*
0930 – 0945	*Break*
0945 – 1100	***Fatigue Crack Growth Analysis*** *Paris Law and Crack Propagation • Fracture Mechanics Approach • Inspection Intervals and Predictive Maintenance • Case Studies in Refinery Piping Fatigue*
1100 – 1230	***Creep Testing Fundamentals*** *Definition and Stages of Creep • Stress Rupture versus Creep Rate Tests • High-Temperature Effects in Refinery Metals • ASTM E139 Standard Requirements*
1230 – 1245	*Break*
1245 – 1330	***Creep Test Interpretation*** *Creep Curve Analysis • Time-to-Rupture Prediction • Larson-Miller Parameter • Material Selection for High-Temperature Service*
1330 – 1345	***Combined Fatigue & Creep Considerations*** *Synergistic Effects in Refinery Components • Turbine Blades, Heat Exchangers, and Piping • Case Studies from Oil and Gas Industry • Failure Prevention Strategies*
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*

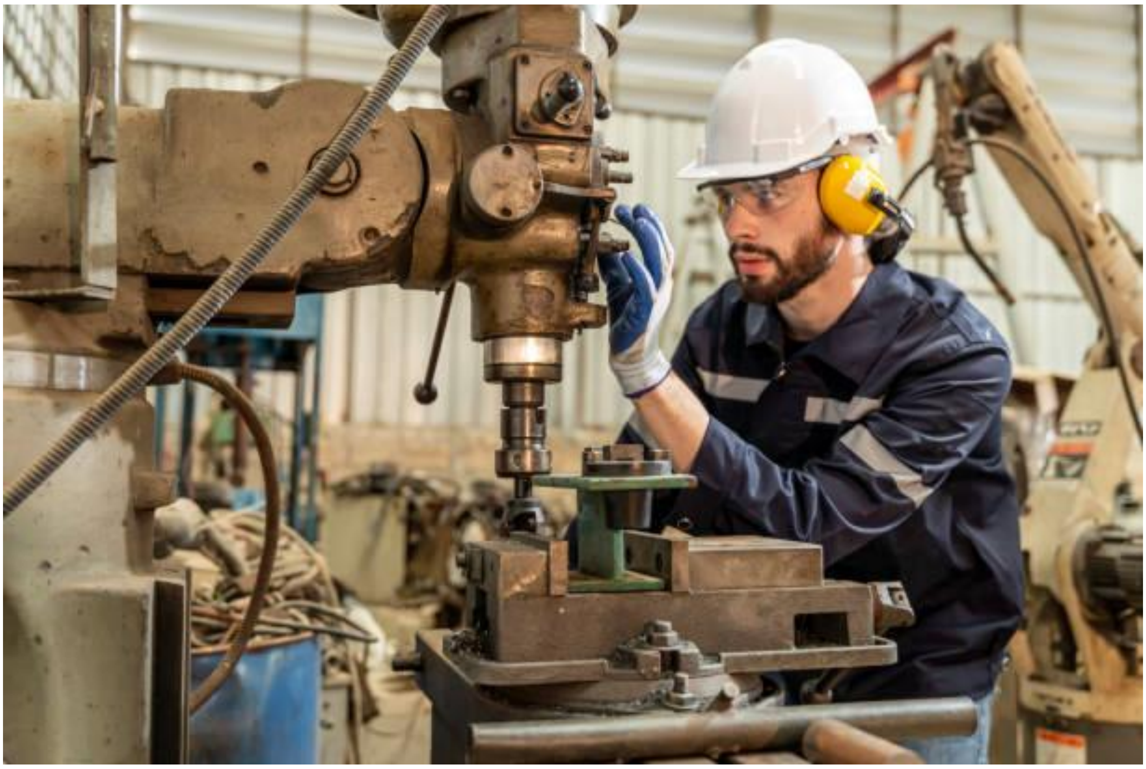
Day 5

0730 – 0830	***Fracture Toughness Testing*** *Principles and Importance • K_IC and J-Integral Concepts • Test Specimen Configurations • ASTM E399 and E1820 Requirements*
0830 – 0930	***Non-Standard & Specialized Mechanical Tests*** *Torsion Tests • Shear Tests • Punch Tests • Hydrogen Embrittlement Testing*
0930 – 0945	*Break*
0945 - 1100	***Data Acquisition & Analysis*** *Digital Data Logging Systems • Statistical Analysis of Test Results • Identifying Outliers and Errors • Correlating Mechanical Test Data with Service Performance*
1100 – 1230	***Failure Analysis Integration*** *Linking Test Results to Root Cause Analysis • Metallography and Fractography Correlation • Predictive Maintenance Insights • Case Histories from Petrochemical Plants*
1230 – 1245	*Break*

1245 – 1345	***Reporting & Documentation*** *Structure of Mechanical Test Reports • Test Certificates and Compliance Documentation • Interpretation for Design and Maintenance Teams • Archiving Test Records for Traceability*
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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