COURSE OVERVIEW FE0352(ES2)

Physical Metallurgy of Steel

Course Title
Physical Metallurgy of Steel

Course Date/Venue
Session 1: June 15-19, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: December 14-18, 2025/Crowne Meeting Room, Crowne Plaza Al Khobar, KSA

Course Reference
FE0352(ES2)

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 Physical Metallurgy of Steel. It covers the fundamentals of Fe-C phase diagram and the phase transformation and crystallography of low medium carbon steels; the annealing, normalizing and stress relieving and present TTT & CCT diagrams; the mechanical properties of steel; and the theory of elastic and plastic deformation.

During this interactive course, participants will learn the hardness test, tensile test, impact test, fatigue test, cold upsetting test and magna flux crack detection test; and the metallographic observation of steel.

Course Objectives

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

- Apply and gain an in-depth knowledge on physical metallurgy of steel
- Identify the fundamentals of Fe-C phase diagram and discuss the phase transformation and crystallography of low medium carbon steels
- Define annealing, normalizing and stress relieving and present TTT & CCT diagrams
- Recognize the mechanical properties of steel and explain the theory of elastic and plastic deformation
- Differentiate hardness test, tensile test, impact test, fatigue test, cold upsetting test and magna flux crack detection test
- Employ metallographic observation of steel

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 physical metallurgy of steel for engineers, inspectors and other technical staff involved in the physical metallurgy of steel.

Course Fee

US$ 10,000 per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

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.
participants.

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.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

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. Ziad Al-Ashaal, BSc, API, CSWIP, ASNT-NDT, ISO, PMP, is a **Senior Inspection Engineer** with extensive years of industrial experience within the **Oil & Gas**, **Refinery** and **Petrochemical** industries. His fields of specialization covers the areas of **Welding & Fabrication** Engineering, **Welding** Technology, **Welding Inspection & Metallurgy**, **Welded & Mechanical** Repairs, **Welding** Procedure Specifications & Qualifications, **Welding** Safety, **Metallurgy**, **Piping** Inspection, **Piping** Systems, **Pipe Fittings**, **Pipeline & Piping** Inspection, **Pipeline** Design & Construction, **Pipeline** Repair Methods, **Pipeline** Engineering, Maintenance, Risk-Based Inspection (**RBI**), **RBI** Analysis, **RBI** Methodology, **RBI** Assessment, Non-Destructive Testing (**NDT**), Fitness-for-Service (**FFS**), Asset Integrity Management (**AIM**), **Pressure Vessel** Inspection, **Above Ground Storage** Inspection, **Corrosion & Material** Management, **Refractory** Inspection, **Welding Inspection & Metallurgy**, **Asset Integrity** Management, **Repairing** & **Integrity** Assessment, **Damage Mechanisms**, **Mechanical & Metallurgical** Failure Mechanisms, **Corrosion** Monitoring, **Corrosion** Detection, **Corrosion** Scanning & **Prevention**, **Material Cutting** & Planning, **Project** Management, **Quality Control** & Assurance. Further, he is an **expert** in Heat Treatment Operation, MFL 3D Floor Mapping (Magnetic Flux Leakage), RBI Software, CMMS MAXIMO, PROTEX and BARCO.

During his career life, Mr. Ziad gained his practical and field experience through his various significant positions and dedication as a **Senior Inspection Engineer/Instructor**, **Senior Asset Integrity & RBI Engineer**, **API Plant Inspector**, **Inspection Engineer**, **Quality Engineer**, **Maintenance Engineer**, **QA/QC Engineer**, **QA/QC Tank Inspector**, **Vendor Inspector**, **Non-metallic Piping Inspector**, **QA/QC Team Leader**, **Shutdown Coordinator** and **Instructor/Trainer** from various international companies such as the ARAMCO, SABIC, SASREF, SEC, CUTECH Arabia LLC, The Egyptian Ethylene and Derivatives Company (ETHYDCO), TECHNIP Energies, Alfa Frost, Mediterranean Textile S.A.E (Albini Group), GSS, El Hamra Oil Co., Titan Cement, just to name a few.

Mr. Ziad has a **Bachelor's** degree in **Production Engineering**. Further he is a **Certified Instructor/Trainer**, a **Source Inspector Fixed Equipment (API SIFE),** a **Certified Piping Inspector** (**API 570**), a **Certified Pressure Vessel Inspector** (**API 510**), a **Certified Aboveground Storage Tank Inspector** (**API 653**), a **Certified Corrosion & Materials Inspector** (**Damage Mechanisms**) (**API 571**), a **Certified Refractory Personnel** (**API 936**), a **Certified Risk Based Inspector** (**API 580**), a **Certified Welding & Metallurgy Inspector** (**API 577**), a **CSWIP 3.1 Certified Welding Inspector**, an **ASNT Certified Level III** in **Magnetic Particle Testing** and a **Level II** in **Visual Testing** (**VT**), **Liquid Penetrant Testing** (**PT**), **Ultrasonic Testing** (**UT**), and **Radiographic Testing** (**RT**) and a **Certified ISO 9001** (**QMS**) **Lead Auditor**. He has further delivered numerous courses, workshops, trainings, seminars 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	***Heat Treatment of Steel*** *Fundamentals of Fe-C Phase Diagram*
0930 – 0945	*Break*
0945 – 1100	***Heat Treatment of Steel (cont'd)*** *Phase Transformation and Crystallography of Low-Medium Carbon Steels*
1100 – 1230	***Heat Treatment of Steel (cont'd)*** *Annealing, Normalizing and Stress Relieving*
1230 – 1245	*Break*
1245 – 1420	***Heat Treatment of Steel (cont'd)*** *TTT & CCT Diagrams*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0900	***Heat Treatment of Steel (cont'd)*** *Hardening & Tempering (Tempcore Process and Martensitic Ring Information)*
0900 – 0915	*Break*
0915 – 1100	***Heat Treatment of Steel (cont'd)*** *Case Hardening (Brief)*
1100 – 1230	***Heat Treatment of Steel (cont'd)*** *Effect of Alloying Elements on Hardenability*
1230 – 1245	*Break*
1245 – 1420	***Heat Treatment of Steel (cont'd)*** *Effect of Alloying Elements on Hardenability (cont'd)*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Mechanical Properties of Steel*** *Theory of Elastic and Plastic Deformation*
0930 – 0945	*Break*
0945 – 1100	***Mechanical Properties of Steel (cont'd)*** *Hardness Test*
1100 – 1215	***Mechanical Properties of Steel (cont'd)*** *Tensile Test*
1215 – 1230	*Break*
1230 – 1420	***Mechanical Properties of Steel (cont'd)*** *Tensile Test (cont'd)*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***Mechanical Properties of Steel (cont'd)*** *Impact Test*
0930 – 0945	*Break*
0945 – 1100	***Mechanical Properties of Steel (cont'd)*** *Fatigue Test*
1100 – 1215	***Mechanical Properties of Steel (cont'd)*** *Cold Upsetting Test*
1215 – 1230	*Break*
1230 – 1420	***Mechanical Properties of Steel (cont'd)*** *Magna Flux Crack Detection Test*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0830	***Metallographic Observation of Steel*** *Sample Preparation Techniques*
0830 – 0930	***Metallographic Observation of Steel (cont'd)*** *Microstructure Study of Steel*
0930 – 0945	*Break*
0945 – 1100	***Metallographic Observation of Steel (cont'd)*** *Grain Size Determination*
1100 – 1215	***Metallographic Observation of Steel (cont'd)*** *NMI Observation*
1215 – 1230	*Break*
1230 – 1345	***Metallographic Observation of Steel (cont'd)*** *Fundamentals of Failure Analysis with Case Studies*
1345 – 1400	***Course Conclusion***
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

Mari Nakintu, Tel: +971 2 30 91 714, Email: mari1@haward.org