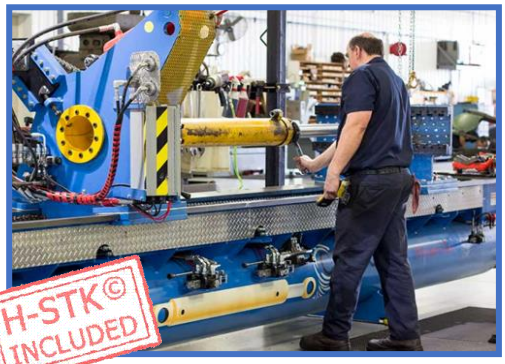
COURSE OVERVIEW PE1068
Fluid Mechanics and Hydraulic Calculation

Course Title
Fluid Mechanics and Hydraulic Calculation

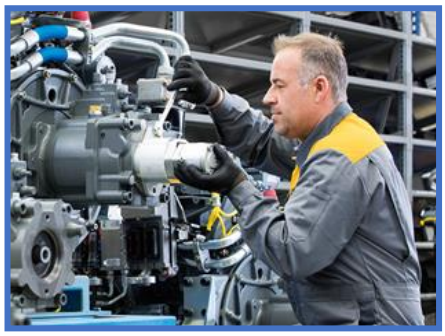


Course Date/Venue
Session 1:September 21-25, 2025/Crowne Meeting Room, Crowne Plaza Al Khobar, an IHG Hotel, Al Khobar, KSA
Session2: December 21-25, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

Course Reference
PE1068

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 Fluid Mechanics and Hydraulic Calculation. It covers the properties and types of fluids and it is applications in engineering systems; the fluid statics, fluid properties and behavior, pressure measurement devices and hydrostatic forces on surfaces; the fluid kinematics, conservation laws, control volume and Bernoulli's equation and applications; the flow measurement techniques, momentum equation and applications and dimensional analysis and similitude; the flow through pipes, laminar and turbulent flow in pipes; and the head loss in pipe systems.

During this interactive course, participants will learn the friction factor calculation, piping system analysis, pump fundamentals and selection and flow rate and velocity calculations; the open channel flow, uniform flow calculations and energy and momentum in open channels; the gradually varied flow (GVF), hydraulic structures and unsteady flow basics; the hydraulic design of piping networks, hydraulic transients and hydraulic structures and dams; the role of CFD in fluid mechanics including governing equations, meshing and boundary conditions and application in system optimization; and the hydraulic system troubleshooting covering leak detection, performance evaluation and maintenance and testing procedures.

Course Objectives

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

- Apply and gain an in-depth knowledge on fluid mechanics and hydraulic calculation
- Discuss the properties and types of fluids and it is applications in engineering systems
- Recognize fluid statics, fluid properties and behavior, pressure measurement devices and hydrostatic forces on surfaces
- Identify fluid kinematics, conservation laws and control volume and Bernoulli's equation and applications
- Carryout flow measurement techniques, momentum equation and applications and dimensional analysis and similitude
- Recognize flow through pipes, laminar and turbulent flow in pipes and head loss in pipe systems
- Apply friction factor calculation, piping system analysis, pump fundamentals and selection and flow rate and velocity calculations
- Identify open channel flow, uniform flow calculations and energy and momentum in open channels
- Discuss gradually varied flow (GVF), hydraulic structures and unsteady flow basics
- Recognize hydraulic design of piping networks, hydraulic transients and hydraulic structures and dams
- Discuss the role of CFD in fluid mechanics including governing equations, meshing and boundary conditions and application in system optimization
- Apply hydraulic system troubleshooting covering leak detection, performance evaluation and maintenance and testing procedures

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 fluid mechanics and hydraulic calculation for engineers, mechanical engineers, civil engineers, chemical engineers, environmental engineers, petroleum engineers, technicians and maintenance personnel, designers and consultants, academic and research personnel, project managers and supervisors 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.

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. Kyle Bester is a **Senior Mechanical & Process Engineer** with extensive years of practical experience within the **Oil & Gas**, **Power & Water Utilities** and other **Energy** sectors. His expertise includes **Process Design & Engineering**, **Piping Control Loops & Heat Exchangers**, **Safe Process Units Start-Up/Shutdown**, Development of Equipment Handling Over/Commissioning Procedures, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant** Performance & Efficiency, **Process Plant** Optimization, Rehabilitation, Revamping & Debottlenecking, **Distillation** Operation & Troubleshooting, Operation of the **Hydrocarbon Process** Equipment, Fired Heaters, Air Coolers, Crude Desalter, **Flare**, **Blowdown & Pressure Relief** Systems Operation, **Separation** Techniques, **Bulk Liquid Storage** Management, **Process Reactors**, **Compressors & Turbines** Troubleshooting, **Pumps & Valves** Installation & Operation, **Bearing & Bearing Failure** Analysis, **Pressure Vessel** & **High Pressure Boiler** Operation, Mechanical Seals, **Pipe** Maintenance & Repair, **Centrifugal & Positive Displacement Pump**, **Rotating Machinery**, **Tank Farm & Tank**, **Process Piping** Design, **Condition Monitoring** System, **Maintenance** Planning & Scheduling, **Maintenance** Shutdown & Turnaround, Reliability-Centered Maintenance (**RCM**), Root Cause Analysis (**RCA**) and Asset Integrity Management (**AIM**). Further, he is also well-versed in **Water Pumping** Station, **Water Distribution & Network** System, **Water Hydraulic** Modelling, **Water Pipelines** Materials & Fittings, **Potable Water Transmission**, **Water Supply & Desalination Plants** Rehabilitation, **Pipes & Fittings**, **Main Water Line** Construction and **Sewage & Industrial Wastewater** Treatment.

During his career life, Mr. Bester has gained his practical and field experience through his various significant positions and dedication as the **Project Manager**, **Asset Manager**, **Process Engineer**, **Water Engineer**, **Maintenance Engineer**, **Mechanical Engineer**, **Team Leader**, **Analyst**, **Process Engineering Dept. Supervisor**, **Landscape Designer** and **Senior Instructor/Trainer** for various international companies as well as infrastructures, water and wastewater treatment plants from New Zealand, UK, Samoa, Zimbabwe and South Africa, just to name a few.

Mr. Bester holds a **Diploma** in **Wastewater Treatment** and a **National Certificate** in **Wastewater & Water Treatment**. Further, he is a **Certified Instructor/Trainer**, an **Approved Chemical Handler** and has delivered numerous courses, trainings, conferences, seminars and workshops 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.

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 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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Fluid Mechanics*** *Definition and Scope • Properties of Fluids: Density, Viscosity, Compressibility • Types of Fluids: Ideal, Real, Newtonian, Non-Newtonian • Applications in Engineering Systems*
0930 – 0945	*Break*
0945 – 1030	***Fluid Statics*** *Pressure and Pressure Measurement • Pascal's Law and Hydrostatic Pressure • Manometers and Barometers • Buoyancy and Stability of Floating Bodies*
1030 – 1130	***Fluid Properties & Behavior*** *Surface Tension and Capillarity • Vapor Pressure and Cavitation • Compressibility and Bulk Modulus • Fluid Classification and Behavior under Shear*
1130 – 1215	***Pressure Measurement Devices*** *Piezometers and U-Tube Manometers • Inclined Manometers • Bourdon Gauges • Pressure Transducers and Sensors*
1215 – 1230	*Break*
1230 – 1330	***Hydrostatic Forces on Surfaces*** *Forces on Submerged Plane Surfaces • Forces on Curved Surfaces • Center of Pressure Calculation • Applications in Tanks and Dams*
1330 – 1420	***Basics of Fluid Kinematics*** *Types of Fluid Flow: Steady/Unsteady, Laminar/Turbulent • Streamlines, Pathlines, and Streaklines • Continuity Equation • Flow Visualization Techniques*
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	***Conservation Laws & Control Volume*** *System versus Control Volume Approaches • Reynolds Transport Theorem • Mass, Momentum, and Energy Conservation • Application in Open and Closed Systems*
0830 - 0930	***Bernoulli's Equation & Applications*** *Derivation and Assumptions • Energy Grade Line and Hydraulic Grade Line • Applications: Venturi Meter, Orifice Plate • Limitations and Corrections*
0930 – 0945	*Break*
0945 – 1100	***Flow Measurement Techniques*** *Differential Pressure Devices • Positive Displacement Meters • Electromagnetic and Ultrasonic Flow Meters • Pitot Tube and Rotameter*
1100 – 1215	***Momentum Equation & Applications*** *Linear Momentum Principle • Force on Bends and Nozzles • Impact of Jets • Applications in Hydraulic Machinery*
1215 – 1230	*Break*
1230 – 1330	***Dimensional Analysis & Similitude*** *Buckingham π-Theorem • Non-Dimensional Numbers (Re, Fr, We, etc.) • Model Testing and Similarity Laws • Application in Scale Modeling*
1330 – 1420	***Flow through Pipes – Basic Concepts*** *Reynolds Number and Flow Regimes • Laminar versus Turbulent Flow Characteristics • Entrance Length and Development • Hydraulic Diameter and Equivalent Length*
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	***Laminar & Turbulent Flow in Pipes*** *Velocity Profiles • Hagen-Poiseuille Equation • Turbulent Flow Characteristics • Shear Stress Distribution*
0830 – 0930	***Head Loss in Pipe Systems*** *Major Head Loss: Darcy-Weisbach Equation • Minor Losses: Fittings, Valves, Bends • Equivalent Length Method • Loss Coefficients and Charts*
0930 – 0945	*Break*
0945 – 1100	***Friction Factor Calculation*** *Moody Chart Usage • Colebrook and Empirical Correlations • Factors Affecting Friction • Turbulence Intensity and Pipe Roughness*
1100 – 1215	***Piping System Analysis*** *Series and Parallel Pipe Networks • Loop and Junction Analysis • Hardy Cross Method • Use of Hydraulic Software Tools*
1215 – 1230	*Break*
1230 – 1330	***Pump Fundamentals & Selection*** *Pump Types and Characteristics • Pump Curves and System Curves • NPSH and Cavitation • Pump Efficiency and Affinity Laws*

1330 – 1420	***Flow Rate & Velocity Calculations*** *Continuity Principal Applications • Velocity Calculation in Pipes • Flowrate Estimation from Pressure Drop • Practical Problems and Solutions*
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	***Open Channel Flow*** *Differences from Pipe Flow • Types of Flow: Uniform, Non-Uniform • Flow Depth and Cross-Sectional Geometry • Applications in Irrigation and Drainage*
0830 – 0930	***Uniform Flow Calculations*** *Manning's Equation • Chezy's Formula • Hydraulic Radius and Slope • Design of Rectangular and Trapezoidal Channels*
0930 – 0945	*Break*
0945 – 1100	***Energy & Momentum in Open Channels*** *Specific Energy and Critical Depth • Specific Force and Momentum Principle • Hydraulic Jump Types and Analysis • Energy Loss in Transitions*
1100 – 1215	***Gradually Varied Flow (GVF)*** *Classification of Water Surface Profiles • Differential Equation of GVF • Method of Computation • Profile Applications and Sketches*
1215 – 1230	*Break*
1230 – 1330	***Hydraulic Structures*** *Weirs and Flumes • Spillways and Stilling Basins • Culverts and Gates • Flow Measurement in Open Channels*
1330 – 1420	***Unsteady Flow Basics*** *Surge Analysis • Water Hammer Phenomenon • Reservoir Operation Principles • Introduction to Flood Routing*
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*

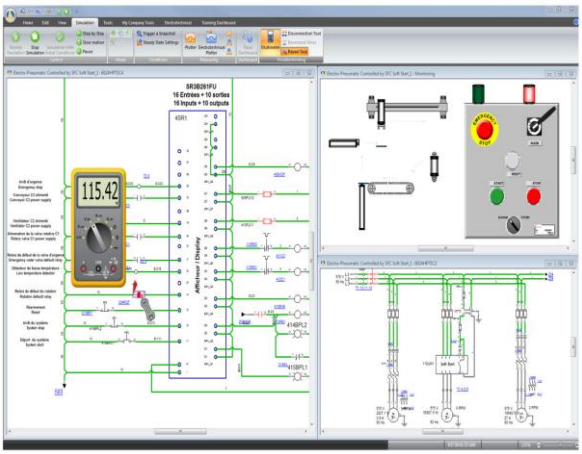
Day 5

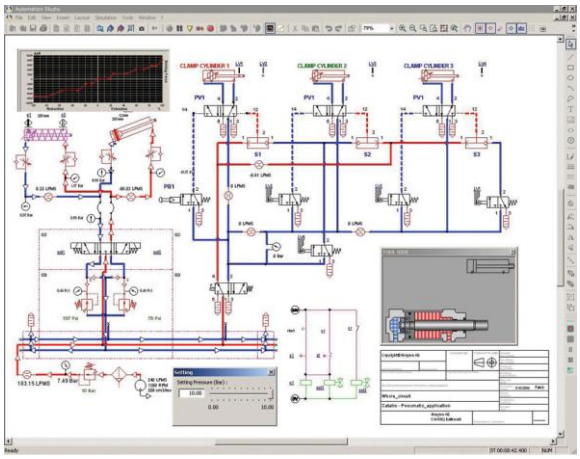
0730 – 0830	***Hydraulic Design of Piping Networks*** *Layout and Sizing • Pump Station Design • Water Distribution Systems • Software Tools (e.g., EPANET)*
0830 – 0930	***Hydraulic Transients*** *Causes and Effects • Mitigation Techniques • Surge Tanks and Air Vessels • Pressure Wave Analysis*
0930 – 0945	*Break*
0945 – 1100	***Hydraulic Structures & Dams*** *Design Considerations • Flow Control and Safety • Energy Dissipation • Case Studies of Structural Failures*

1100 – 1215	***Computational Fluid Dynamics (CFD) Introduction*** *Role of CFD in Fluid Mechanics • Governing Equations • Meshing and Boundary Conditions • Application in System Optimization*
1215 – 1230	*Break*
1230 – 1300	***Hydraulic System Troubleshooting*** *Diagnosing Flow Issues • Leak Detection • Performance Evaluation • Maintenance and Testing Procedures*
1300 - 1345	***Hands-on Practice & Case Studies*** *Real-World Design Problems • Pipe Network Simulation • Open Channel Design Scenario • Group Project Presentation*
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*

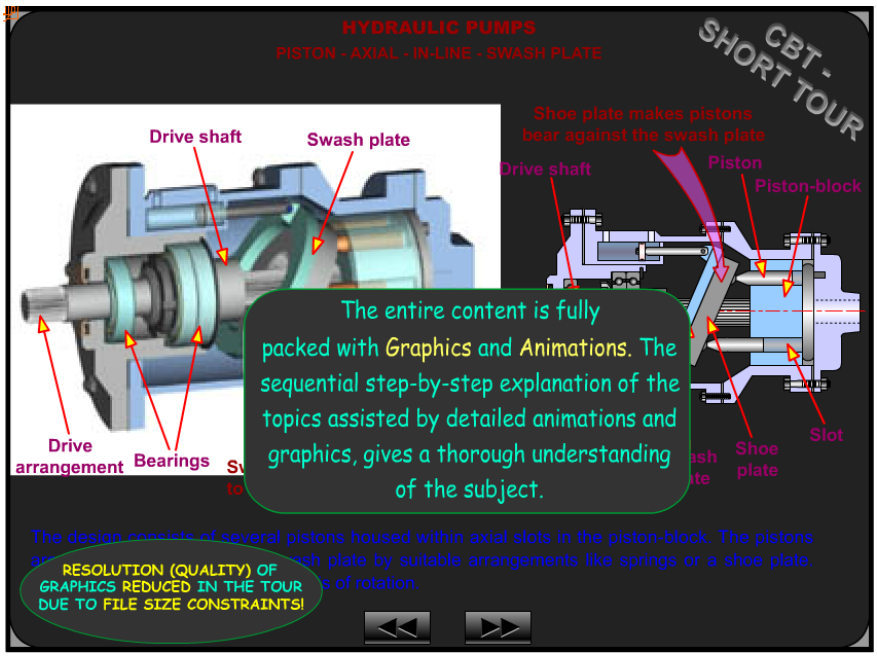
Simulator (Hands-on Practical Sessions)

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 "Automation Studio (Hydraulic & Pneumatic Software)" and "Industrial Hydraulic Software".





"Automation Studio (Hydraulic & Pneumatic Software)"



Industrial Hydraulics Software

Course Coordinator

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