

# COURSE OVERVIEW PE0151 Process Engineering - Design and Operation

## Course Title

Process Engineering - Design and Operation

### **Course Date/Venue**

Session 1: July 21-25, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE Session 2: September 07-11, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

# Course Reference

PE0151

Course Duration/Credits Five days/3.0 CEUs/30 PDHs

#### Course Description









#### This hands-on, highly-interactive course includes 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 process engineering design. It covers the basic chemical calculations and energy balances; the enthalpy changes accompanying chemical reactions as well as heat changes in mixing processes; the examples of alternative routes in process engineering and generalized approach to the chemical plant design; the operating instructions manual, conductance of performance test runs and troubleshooting; and the cost cutting measures, green engineering, process intensification, need for PFD and P&ID and block diagrams.

Further, this course will also discuss the development and utility of process flow diagrams; the development of piping and instrumentation diagrams; the process design of piping, process design of fluid moving devices and evaluation of centrifugal pump performance when handling viscous liquids; the power required in fan, blower an in adiabatic compressor; the flow meter, process design of orifice meter and rotameter and two phase flow; troubleshooting fluid flow systems and design of heat exchangers; the criteria of selection between horizontal condenser and vertical condenser; the multicomponent condensation, process design of reboilers and vaporizers and tinker's flow model; and the air cooled heat exchangers and air heaters including plate heat exchangers and spiral flow heat exchangers.



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During this interactive course, participants will learn the brazed aluminium plate-fin heat exchanger and design of liquid-liquid extractor; the desirable solvent properties or choice of solvent and design of counter current multistage extractor; the supercritical extractor (SCE), process design of distillation columns, batch distillation and short path distillation; the reactive and catalytic distillation, azeotropes and separation thereof and the process design of absorbers; the design of packed tower type absorber and process design of spray chamber or spray tower type absorber; the venturi scrubber, process design of falling film absorber and process design of reactors; the batch reactor, continuous flow reactors and mixing for the different type of reaction systems; and the bubble column reactor and design of fixed catalyst bed reactors for gaseous reactions.

# Course Objectives

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

- Apply and gain an in-depth knowledge on process engineering design
- Discuss process engineering, basic chemical calculations and energy balances
- Describe enthalpy changes accompanying chemical reactions as well as heat changes in mixing processes
- List various examples of alternative routes in process engineering and generalized approach to the chemical plant design
- Prepare operating instructions manual and discuss the conductance of performance test runs and troubleshooting
- Identify cost cutting measures, green engineering, process intensification, need for PFD and P&ID and block diagrams
- Illustrate the development and utility of process flow diagrams as well as the development of piping and instrumentation diagrams
- Review process design of piping and process design of fluid moving devices as well as evaluate centrifugal pump performance when handling viscous liquids
- Identify power required in fan, blower and in adiabatic compressor
- Determine flow meters, process design of orifice meter, process design of rotameter and two phase flow
- Troubleshoot fluid flow systems, design heat exchangers and identify the criteria of selection between horizontal condenser and vertical condenser
- Recognize multicomponent condensation, process design of reboilers and vaporizers and tinker's flow model
- Discuss air cooled heat exchangers and air heaters including plate heat exchangers and spiral flow heat exchangers
- Explain brazed aluminium plate-fin heat exchanger and the design of liquid-liquid extractor
- Select desirable solvent properties or choice of solvent and design of counter current multistage extractor
- Describe supercritical extractor (SCE), process design of distillation columns, batch distillation and short path distillation



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- Define reactive and catalytic distillation, azeotropes and separation thereof and the process design of absorbers
- Design packed tower type absorber and process design of spray chamber or spray tower type absorber
- Explain venturi scrubber, process design of falling film absorber and process design of reactors
- Discuss batch reactor, continuous flow reactors and mixing for the different type of reaction systems
- Recognize bubble column reactor and design of fixed catalyst bed reactors for gaseous reactions

# Exclusive Smart Training Kit - H-STK<sup>®</sup>



Participants of this course will receive the exclusive "Haward Smart Training Kit" (H-STK<sup>®</sup>). The H-STK<sup>®</sup> 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 a basic overview of all significant aspects and considerations of process engineering design for those involved with the purchase, design, fabrication, or inspection of piping projects including users, manufacturers, repair organisations, inspection agencies and other organisations involved with the design, maintenance and repair of industrial plants.

#### 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**

US\$ 5,500 per Delegate + VAT. The rate includes H-STK<sup>®</sup> (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

## <u>Accommodation</u>

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



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# 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.



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#### 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 Bearing & Bearing Failure Analysis, Centrifugal, Reciprocating & Screw Compressor, Gas Turbine Repair, Pump Installation & Operation, Compressors & Turbines Troubleshooting, Coupling, Gear Boxes, Bearings & Lubrication, Mechanical Seals, Bearings & Seals, Pressure Vessel Design & Analysis, Steam & Gas Turbine, High Pressure Boiler Operation, Compressors Operation &<br/>Maintenance, Pipe Maintenance & Repair, Centrifugal & Positive<br/>Displacement Pump, Rotating Machinery, PD Compressor & Gas Engine Operation &

Troubleshooting, Hydraulic Tools & Fitting, Mass & Material Balance, Water Distribution & Pump Station, Tank Farm & Tank Terminal, Process Piping Design, Stack & Noise Monitoring, HVAC & Refrigeration Systems, Condition Monitoring System, Maintenance Planning & Scheduling, Maintenance Shutdown & Turnaround, Maintenance Audit Best Practices, Maintenance & Reliability Management, Reliability, Availability & Maintainability (RAM), Root Cause Analysis, Reliability-Centered Maintenance (RCM), Reliability Engineering Analysis (RE), Root Cause Analysis (RCA), Asset Integrity Management (AIM), Reactive & Proactive Maintenance, Mechanical & Rotating Equipment Troubleshooting & Maintenance, Maintenance Management & Cost Control, Operation of the Hydrocarbon Process Equipment, Fired Heaters, Air Coolers, Heat Exchangers, Crude Desalter, Pressure Vessels & Valves, Flare, Blowdown & Pressure Relief Systems Operation, Separation Techniques, Bulk Liquid Storage Management & Tanks Cleaning, Ammonia Manufacturing & Process Troubleshooting, Process Equipment Design, Process Reactors and Chemical Engineering. Further, he is also well-versed in Water Reservoir, Water Tanks, Water Pumping Station, Water Distribution System, Water Network System, Water Pipes & Fittings, Water Hydraulic Modelling, Water Storage Reservoir, Reservoirs & Pumping Stations Design & Operation, Pumping Systems, Interconnecting Pipelines, Water Network Hydraulic Simulation Modelling, Water Supply Design, Water Balance Modelling, Water Distribution Network, Water Network System Analysis, Water Forecasts Demand, Water Pipelines Materials & Fittings, Water Network System Design, Pump Houses & Booster Pumping Stations, Potable Water Transmission, Water Distribution Network, Districts Meters Areas (DMAs), Water Supply & Desalination Plants Rehabilitation, Water Reservoirs & Pumping Stations, Water Network System Extension, Water Network System Replacement & Upgrade, Water Networks Optimization, Water Supply & Distribution Systems Efficiency & Effectiveness, Pipe Materials & Fittings, Service Reservoir Design & Operation, Pipes & Fittings, Water Network System Design & Operation, Supply Water Network Rehabilitation, Water Loss Reduction, Main Water System Construction, Main Water Line Construction, Transmission & Distribution Pipelines, Water Distribution Design & Modelling, Water Supply System, Oilfield Water Treatment, Best Practice in Sewage & Industrial Wastewater Treatment & Environmental Protection, Water Distribution Design & Modelling, Desilting, Treating & Handling Oily Water, Water Chemistry for Power Plant, Water Sector Orientation, Environmental Impact Assessment (EIA). He is currently the Part Owner & Manager of Extreme Water SA wherein he manages, re-designed and commissioned a water and wastewater treatment plants.

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, Water Engineer, Maintenance Engineer, Mechanical Engineer, Process Engineer, Supervisor, Team Leader, Analyst, Process Technician, Landscape Designer and Senior Instructor/Trainer for various international companies, 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.



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## 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: Dav1

Registration & Coffee
Welcome & Introduction
PRE-TEST
Introduction to Process Engineering
Basic Chemical Calculations
Energy Balances
Break
Enthalpy Changes Accompanying Chemical Reactions
Heat Changes in Mixing Processes
<b>Examples of Alternative Routes in Process Engineering</b>
Generalized Approach to the Chemical Plant Design
Preparation of Operating Instructions Manual
Break
Conductance of Performance Test Runs
Troubleshooting
Cost Cutting Measures
Recap
Lunch & End of Day One

## Dav 2

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0730 – 0800	Green Engineering
0800 - 0830	Process Intensification
0830 - 0945	Need for PFD & P&ID
0945 – 1000	Block Diagrams
1000 – 1015	Break
1015 – 1045	Development & Utility of Process Flow Diagrams
1045 – 1100	Development of Piping & Instrumentation Diagrams
1100 – 1130	Process Design of Piping
1130 – 1200	Process Design of Fluid Moving Devices
1200 – 1215	Break
1215 1245	Evaluation of Centrifugal Pump Performance When Handling Viscous
1213 - 1243	Liquids
1245 – 1330	Power Required in Fan, Blower & in Adiabatic Compressor
1330 - 1420	Flow Meters
1420 - 1430	Recap
1430	Lunch & End of Day Two

#### Dav 3

0730 – 0800	Process Design of Orifice Meter
0800 - 0830	Process Design of Rotameter
0830 - 0845	Two Phase Flow
0845 - 0900	Troubleshooting of Fluid Flow Systems



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0900 - 0915	Break
0915 – 1000	Design of Heat Exchangers
1000 1045	Criteria of Selection Between Horizontal Condenser & Vertical
1000 - 1045	Condenser
1045 – 1115	Multicomponent Condensation
1115 – 1200	Process Design of Reboilers & Vaporizers
1200 – 1215	Break
1215 – 1300	Tinker's Flow Model
1300 – 1330	Air Cooled Heat Exchangers & Air Heaters
1330 - 1420	Plate Heat Exchangers
1420 - 1430	Recap
1430	Lunch & End of Day Three

## Dav 4

0730 – 0800	Spiral Flow Heat Exchangers
0800 - 0830	Brazed Aluminium Plate-Fin Heat Exchanger
0830 - 0900	Design of Liquid-Liquid Extractor
0900 - 0915	Desirable Solvent Properties or Choice of Solvent
0915 – 0930	Break
0930 - 1000	Design of Counter Current Multistage Extractor
1000 - 1030	Supercritical Extractor (SCE)
1030 - 1100	Process Design of Distillation Columns
1100 – 1145	Batch Distillation
1145 – 1200	Break
1200 – 1245	Short Path Distillation
1245 – 1330	Reactive & Catalytic Distillation
1330 - 1420	Azeotropes & Separation Thereof
1420 - 1430	Recap
1430	Lunch & End of Day Four

## Day 5

0730 - 0800	Process Design of Absorbers
0800 - 0830	Design of Packed Tower Type Absorber
0830 - 0900	Process Design of Spray Chamber or Spray Tower Type Absorber
0900 - 0930	Venturi Scrubber
0930 - 0945	Break
0945 – 1015	Process Design of Falling Film Absorber
1015 – 1045	Process Design of Reactors
1045 – 1130	Batch Reactor
1130 – 1215	Continuous Flow Reactors
1215 – 1230	Break
1230 – 1300	Mixing for the Different Type of Reaction Systems
1300 - 1330	Bubble Column Reactor
1330 - 1345	Design of Fixed Catalyst Bed Reactors for Gaseous Reactions
1345 – 1400	Course Conclusion
1400 - 1415	POST-TEST
1415 - 1430	Presentation of Course Certificates
1430	Lunch & End of Course



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## 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 "Gas Ultrasonic Meter (USM) Sizing Tool", "Liquid Turbine Meter and Control Valve Sizing Tool", "Liquid Ultrasonic Meter Sizing Tool" and "Orifice Flow Calculator" simulator.

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# Course Coordinator

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



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