COURSE OVERVIEW PE0570-4D

Chemical Process Simulation & Design

Course Title
Chemical Process Simulation & Design

Course Date/Venue
Please see page 3

Course Reference
PE0570-4D

Course Duration/Credits
Four days/2.4 CEUs/24 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 Chemical Process Simulation & Design. It covers the process simulation, user interface and project setup in simulation software; the physical property methods and data input, material and energy balances and process flow diagrams (PFDs); the distillation column modelling, heat exchanger simulation & sizing, pump and compressor simulation and chemical reactor modelling; and the flash and separator operations covering single-stage flash calculations, multi-phase separators, specifying pressure, temperature, and phase splits and applications in upstream/downstream processes.

During this interactive course, participants will learn the recycle streams and process convergence; the sensitivity and parametric analysis, economic evaluation, cost estimation and environmental and safety integration; the advanced thermodynamic models and non-ideal systems; the energy integration and pinch analysis; the process optimization techniques covering objective function definition, constraint identification and solver configuration and use; the design workflow, equipment sizing principles and the role of simulation in feed and EPC phases; the proper selection of effects and sequence; and the steam economy, energy efficiency, simulation and validation and performance optimization.

Course Objectives

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

- Apply and gain an in-depth knowledge on chemical process simulation and design
- Discuss process simulation, user interface and project setup in simulation software and physical property methods and data input
- Recognize material and energy balances and develop process flow diagrams (PFDs)
- Illustrate distillation column modelling, heat exchanger simulation & sizing, pump and compressor simulation and chemical reactor modelling
- Carryout flash and separator operations covering single-stage flash calculations, multi-phase separators, specifying pressure, temperature, and phase splits and applications in upstream/downstream processes
- Discuss recycle streams and process convergence and employ sensitivity and parametric analysis, economic evaluation and cost estimation and environmental and safety integration
- Identify advanced thermodynamic models and non-ideal systems and apply energy integration and pinch analysis
- Carryout process optimization techniques covering objective function definition, constraint identification and solver configuration and use
- Discuss design workflow, equipment sizing principles and the role of simulation in feed and EPC phases
- Apply proper selection of effects and sequence and discuss steam economy and energy efficiency, simulation and validation and performance optimization

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 chemical process simulation and design for process engineers, chemical engineers, project engineers, design engineers, plant engineers, operation engineers, R&D engineers, innovation team members, technical managers, engineering supervisors, graduate chemical engineering students, researchers in process simulation, quality assurance professionals, process safety engineers and other technical staff.

Accommodation

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

Course Fee

US$ 4,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Course Date/Venue

Session(s)	Date	Venue
1	May 18-21, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
2	July 07-10, 2025	Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
3	September 28-October 01, 2025	Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE
4	November 24-27, 2025	Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

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 **2.4 CEUs** (Continuing Education Units) or **24 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. Manuel Dalas, PEng, MSc, BSc, is a **Senior Process Engineer** with over **25 years** of industrial experience within the **Oil & Gas**, **Refinery**, **Petrochemical** and **Refinery** industries. His expertise widely includes in the areas of **Pressure Relief Valves, Pressure Vessels** Maintenance & Operation, **Piping Support**, **Ironworks**, **Rotating & Static Equipment** (**Pumps**, **Valves**, **Boilers**, **Pressure Vessels**, **Tanks**, **Heat Exchangers**, **Bearings**, **Compressors**, **Pipelines**, **Motors**, **Turbines**, **Gears**, **Seals**), **Crude Distillation Process**, **Saturation Gas Process** Technology, **Crude Dehydration & Desalting**, **Crude** Stabilization Operations, **Process Plant** Performance & Efficiency, **Heat Exchangers & Fired Heaters** Operation & Troubleshooting, **Process Plant** Optimization, **Revamping & Debottlenecking**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Mass & Material Balance**, **Oil & Gas** Processing, **Oil Field** Operation, **Process Plant** Operation & Troubleshooting, **Hydrogen Sulphide Stripping**, **Crude Oil De Salting** Process, **Gas Conditioning**, **NGL Recovery & NGL Fractionation**, **Flare** Systems, Pre-Fabrication of **Steel Structure**, Alloy Piping Pre-Fabrication, **Heat Exchangers**, **Vertical Columns/Pressure Vessels**, **Distillation Column**, **Steel Structures**, **Construction** Management, **Building** Structures and **Electrical-Mechanical Equipments**. Further, he is also a well-versed in **Materials** Management, **Inventory Control** and Workplace Housekeeping. Currently, he is the **Technical Consultant** of the **Association of Local Authorities** of **Greater Thessaloniki** where he is in-charge of the mechanical engineering services for piping, pressure vessels fabrications and ironwork.

During his career life, Mr. Dalas has gained his practical and field experience through his various significant positions and dedication as the **Technical Manager**, **Construction Manager**, **Project Engineer**, **Production Engineer**, **Construction Engineer**, **Consultant Engineer**, **Technical Consultant**, **Safety Engineer**, **Mechanical Engineer**, **External Collaborator**, **Deputy Officer** for various companies including the Alpha Astika, Anamorfosis Technical Firm, EKME, ASTE, Elof Consulting and Hypergroup.

Mr. Dalas is a **Registered Professional Engineer** and has a **Master's** degree in **Energy System** from the **International Hellenic University** and a **Bachelor's** degree in **Mechanical Engineering** from the **Mechanical Engineering Technical University**, **Greece** along with a **Diploma** in **Management & Production Engineering** from the **Technical University** of **Crete**. Further, he is a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership and Management** (**ILM**), a **Certified Project Manager Professional** (**PMI-PMP**), a **Certified Instructor/Trainer**, a **Certified Energy Auditor** for **Buildings**, **Heating & Climate Systems**, a **Member** of the **Hellenic Valuation Institute** and the **Association of Greek Valuers** and a **Licensed Expert Valuer Consultant** of the **Ministry of Development and Competitiveness**. He has further delivered numerous trainings, courses, seminars, conferences and workshops internationally.

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 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	***Introduction to Process Simulation*** *Role of Simulation in Process Design • Benefits of Process Simulation in Industry • Static versus Dynamic Simulation • Overview of Commercial Software (Aspen Plus, HYSYS, CHEMCAD)*
0930 – 0945	*Break*
0945 - 1030	***User Interface & Project Setup in Simulation Software*** *Navigating the Simulation Environment • Creating a New Simulation Project • Unit Selection (SI versus English) • File Management & Documentation*
1030 – 1130	***Physical Property Methods & Data Input*** *Choosing Appropriate Thermodynamic Models (EOS, Activity Coefficient Models) • Component Selection from Databases • User-Defined Components & Pseudo-Components • Property Estimation & Validation*
1130 – 1215	***Material & Energy Balances*** *Mass Balance Fundamentals • Energy Balance Principles • Applying Balances in Flowsheets • Use of Simulation to Validate Balances*
1215 – 1230	*Break*
1230 – 1330	***Developing Process Flow Diagrams (PFDs)*** *Representation of Unit Operations • Material & Energy Streams • Recycle Loops & Flow Configurations • Process Convergence Basics*
1330 – 1420	***Simple Process Case Study: Mixing & Heating Systems*** *Simulation of Mixer-Heater Systems • Specification of Operating Conditions • Parameter Sensitivity Analysis • Results Interpretation & Validation*
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	***Distillation Column Modeling*** *Binary versus Multicomponent Distillation • Tray versus Packed Columns • Column Specifications (Reflux, Stages, Feeds) • Performance Analysis (Recovery, Purity)*
0830 – 0930	***Heat Exchanger Simulation & Sizing*** *Types of Exchangers (Shell & Tube, Plate, Air-Cooled) • Heat Transfer Principles • Design Parameters & Constraints • Temperature Profiles & Pinch Analysis*
0930 – 0945	*Break*
0945 – 1100	***Pump & Compressor Simulation*** *Fluid Handling Equipment Overview • Pressure-Flow Relationship • Efficiency & Power Requirements • Curve Fitting & Equipment Selection*
1100 – 1215	***Chemical Reactor Modeling*** *Reactor Types: CSTR, PFR, Batch • Reaction Kinetics Input • Conversion, Yield & Selectivity • Energy Balances in Reactive Systems*
1215 – 1230	*Break*
1230 – 1330	***Flash & Separator Operations*** *Single-Stage Flash Calculations • Multi-Phase Separators • Specifying Pressure, Temperature & Phase Splits • Applications in Upstream/Downstream Processes*
1330 – 1420	***Recycle Streams & Process Convergence*** *Challenges in Recycle Loops • Convergence Strategies & Algorithms • Tear Streams & Iterative Solutions • Case Study: Recycle Heat Exchanger Network*
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	***Sensitivity & Parametric Analysis*** *Varying Operating Conditions • Impact on Product Quality & Utility Consumption • Use of Sensitivity Plots • Optimization Strategies*
0830 – 0930	***Economic Evaluation & Cost Estimation*** *Capital Cost Estimation Techniques • Operating Cost Calculation • Utility Costing & Consumption • Profitability Indicators (NPV, ROI)*
0930 – 0945	*Break*
0945 – 1100	***Environmental & Safety Integration*** *Emission Modeling in Simulation • Flare & Vent System Simulations • Safety Factor Consideration in Design • Environmental Impact Evaluation*
1100 – 1215	***Advanced Thermodynamic Models & Non-Ideal Systems*** *Activity Coefficient Models (NRTL, UNIQUAC) • Equation of State Models (Peng-Robinson, Soave-Redlich-Kwong) • Electrolyte Systems & Azeotropes • Handling Complex Mixtures*
1215 – 1230	*Break*
1230 – 1330	***Energy Integration & Pinch Analysis*** *Composite Curves & Grand Composite Curve • Minimum Utility Targets • Heat Exchanger Network (HEN) Design • Pinch-Based Retrofit Strategies*

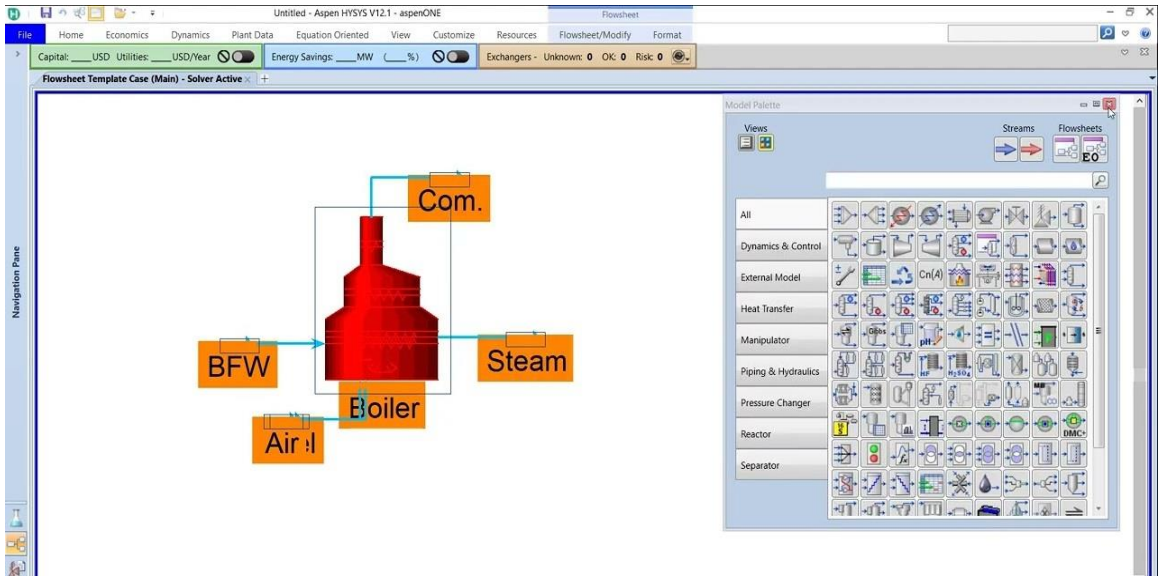
1330 – 1420	***Process Optimization Techniques*** *Objective Function Definition • Constraint Identification • Solver Configuration & Use • Case Studies in Energy & Cost Optimization*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

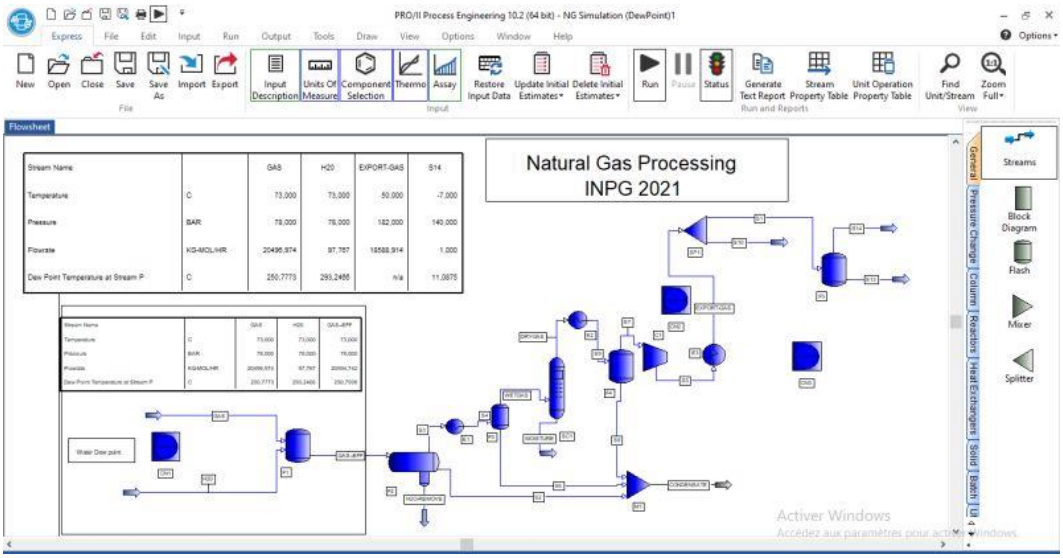
0730 – 0830	***Process Design Methodology*** *Design Workflow: Conceptual to Detailed Design • Equipment Sizing Principles • Integration of Simulation with Design Software • Role of Simulation in FEED & EPC Phases*
0830 – 0930	***Design of Multi-Effect Evaporator System*** *Selection of Effects & Sequence • Steam Economy & Energy Efficiency • Simulation & Validation • Performance Optimization*
0930 – 0945	*Break*
0945 – 1100	***Simulation-Based Case Study: Gas Sweetening Unit*** *Overview of Amine Gas Treating Process • Absorber & Regenerator Simulation • Impact of Lean Loading & Temperature • Optimization of Circulation Rates*
1100 – 1215	***Simulation-Based Case Study: Crude Distillation Unit*** *CDU Flowsheet Development • Preheat Train Modeling • Atmospheric Distillation Column Simulation • Product Draw Analysis & Yield Calculation*
1215 – 1230	*Break*
1230 – 1330	***Dynamic Simulation Overview*** *Steady-State versus Dynamic Simulation • Dynamic Models for Control Analysis • Simple Surge Tank Dynamics • Emergency Shutdown Scenario Modeling*
1330 - 1345	***Project Work & Presentation*** *Group Simulation Project (User-Selected Process) • Step-By-Step Simulation Development • Presentation of Results & Findings • Peer Feedback & Instructor Evaluation*
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 session 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 state-of-the-art simulators "ASPEN HYSYS" "Pro-II" and simulator.



ASPEN HYSYS V14 Simulator



Pro-II Simulator

Course Coordinator

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