COURSE OVERVIEW PE0341
Hydrocarbon Process Design & Modelling

Course Title
Hydrocarbon Process Design & Modelling

Course Date/Venue
November 23-27, 2025/Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE

Course Reference
PE0341

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 Hydrocarbon Process Design & Modelling. It covers the common hydrocarbon processing units, economic significance and value chain and environmental and safety considerations; the basic thermodynamics for hydrocarbon systems, process flow diagram (PFD) and piping and instrumentation diagram (P&ID); the material and energy balances, fluid flow in hydrocarbon systems and process simulation tools; and the heat exchanger design, distillation column design, pump and compressor design and vessel and reactor design.

Further, the course will also discuss the process control strategies, process safety considerations, Aspen HYSYS interface and navigation and steady-state simulation of hydrocarbon processes; the dynamic simulation basics, reaction kinetics and reactor modelling, utilities and supporting systems modelling and economic evaluation in simulation; the crude oil distillation and blending, gas processing, NGL recovery and refinery conversion processes; the process integration and pinch analysis, multiphase separation and flash calculations; and the optimization techniques in process design.

During this interactive course, participants will learn the process modelling troubleshooting, debottlenecking and capacity expansion and digital transformation in process design; the VOCs, NOx, SOx emission simulation, wastewater and effluent modelling, flaring systems and environmental impact and simulation tools for ESG reporting; generating design basis documents and simulating report writing; and the equipment datasheets and PFD generation and client presentation techniques.

Course Objectives

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

- Apply and gain an in-depth knowledge on hydrocarbon process design and modeling
- Identify common hydrocarbon processing units, economic significance and value chain and environmental and safety considerations
- Recognize basic thermodynamics for hydrocarbon systems and process flow diagram (PFD) and piping and instrumentation diagram (P&ID)
- Discuss material and energy balances, fluid flow in hydrocarbon systems and process simulation tools
- Illustrate heat exchanger design, distillation column design, pump and compressor design and vessel and reactor design
- Carryout process control strategies, process safety considerations, Aspen HYSYS interface and navigation and steady-state simulation of hydrocarbon processes
- Illustrate dynamic simulation basics, reaction kinetics and reactor modelling, utilities and supporting systems modelling and economic evaluation in simulation
- Apply crude oil distillation and blending, gas processing, NGL recovery and refinery conversion processes
- Carryout process integration and pinch analysis, multiphase separation, flash calculations and optimization techniques in process design
- Employ process modelling troubleshooting, debottlenecking and capacity expansion and digital transformation in process design
- Discuss VOCs, NOx, SOx emission simulation, wastewater and effluent modelling, flaring systems and environmental impact and simulation tools for ESG reporting
- Generate design basis documents, simulate report writing, describe equipment datasheets and PFD generation and apply client presentation techniques

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 hydrocarbon process design and modeling for chemical engineers with 0-5 years experience and familiar with HYSYS.

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:

Mr. Dimitry Rovas, CEng, MSc, PMI-PMP, SMRP-CMRP is a **Senior Engineer** with extensive industrial experience in **Oil**, **Gas**, **Power** and **Utilities** industries. His expertise includes **Gas Conditioning & Processing**, **Process Plant** Optimization, Effective **Production Operations** in the Oil & Gas Fields, Advanced Process Safety Management (**PSM**), **Process Equipment** Design, Applied **Process** Engineering, **Oil Production & Processing** Facilities, P**rocess Plant Optimization & Rehabilitation**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Operations Abnormalities & Plant Upset**, **Glass Reinforced Plastics**, **GRP Resins**, **Pipe Products & Applications**, **Pipe** System Designs & Installation, **Steel & Fiberglass** Construction, **GRP Linings** & Method Application, **Rubber Com**pounding, Elastomers, Thermoplastic, Industrial Rubber Products, Rubber Manufacturing Systems, **Heat Transfer**, **Vulcanization** Methods, **Energy Conservation**, **Energy Loss** Management in Electricity Distribution Systems, **Energy Saving**, **Thermal Power Plant** Management, **Thermal Power Plant** Operation & Maintenance, **Gas & Steam Turbines**, **Turbine Operations**, **Heat Transfer**, **Machine Design**, **Fluid Mechanics**, **Heating & Cooling Systems**, **Heat Insulation** Systems, **Heat Exchanger & Cooling Towers**, **Mechanical Erection**, **Heavy Rotating Equipment**, **HAZMAT & HAZCOM**, **Hazardous Materials & Chemicals MSDS**, Modern Heating, Ventilation, Air-Conditioning (**HVAC**) **& Refrigeration** Systems, Emergency **Air Compressors**, **Gas Turbine** Condition Monitoring & Fault Diagnosis, Modern **Valve** Technology, **Pumps & Valves**, Detailed Engineering Codes & Standards, **Hydraulic** System Overhaul & Troubleshooting, **Hydraulic** System Design & Troubleshooting, **Boiler** Maintenance & Inspection, **Pipe Stress** Analysis, Material Unloading & Storage, Commissioning & Start-Up. Further, he is also well-versed in MS project & AutoCAD, EPC Power Plant, Power Generation, Combined Cycle Powerplant, Leadership & Mentoring, Project Management, Strategic Planning/Analysis, Construction Management, Team Formation, Relationship Building, Communication, Reporting and Six Sigma. He was the **Project Manager** wherein he was managing, directing and controlling all activities and functions associated with the domestic heating/cooling facilities projects.

During his life career, Mr. Rovas has gained his practical and field experience through his various significant positions and dedication as the **EPC Project Manager**, **Field Engineer**, **Preventive Maintenance Engineer**, **Researcher**, **Instructor/Trainer**, **Telecom Consultant** and **Consultant** from various companies such as the Podaras Engineering Studies, Metka and Diadikasia, S.A., **Hellenic Petroleum Oil Refinery** and COSMOTE.

Mr. Rovas is a **Chartered Engineer** of the **Technical Chamber** of **Greece**. Further, he has **Master's** degree in **Mechanical Engineering** and **Energy Production & Management** from the **National Technical University of Athens**. Moreover, he is a **Certified Instructor/Trainer**, a **Certified Maintenance and Reliability Professional** (**CMRP**) from the Society of Maintenance & Reliability Professionals (**SMRP**), a **Certified Project Management Professional** (**PMP**), a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and a **Certified Six Sigma Black Belt**. He is an active member of Project Management Institute (**PMI**), Technical Chamber of Greece and Body of Certified Energy Auditors and has further delivered numerous 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 workshop for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1: ***Sunday 23rd of November 2025***

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Hydrocarbon Processing Industry*** *Overview of Upstream, Midstream and Downstream Sectors • Common Hydrocarbon Processing Units • Economic Significance and Value Chain • Environmental and Safety Considerations*
0930 – 0945	*Break*
0945 – 1030	***Basic Thermodynamics for Hydrocarbon Systems*** *Phase Behavior of Hydrocarbon Mixtures • Equations of State (EOS) and PVT Properties • Vapor-Liquid Equilibrium (VLE) • Thermodynamic Consistency Checks*
1030 – 1130	***Process Flow Diagram (PFD) & Piping & Instrumentation Diagram (P&ID)*** *Symbols and Standards (ISA/ISO) • Equipment and Line Numbering • Instrumentation and Control Representation • Developing and Reading PFDs and P&IDs*
1130 – 1215	***Material & Energy Balances*** *Mass Balance for Single and Multiple Components • Energy Balance with Heat and Work Interactions • Combined Material-Energy Balance Applications • Use of Balances in Process Simulations*
1215 – 1230	*Break*
1230 – 1330	***Fluid Flow in Hydrocarbon Systems*** *Pressure Drop in Pipes and Fittings • Pump and Compressor Sizing Fundamentals • Multiphase Flow Behavior • Pipeline Network Design Basics*
1330 – 1420	***Basics of Process Simulation Tools*** *Role of Simulation in Process Design • Overview of Software (Aspen HYSYS, Aspen Plus, PRO/II) • Data Input Requirements • Model Verification and Convergence*
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: ***Monday 24th of November 2025***

0730 – 0830	***Heat Exchanger Design*** *Heat Transfer Principles • Shell and Tube Exchanger Configurations • Fouling Factors and TEMA Standards • Thermal and Mechanical Design Using Software*
0830 - 0930	***Distillation Column Design*** *Types of Distillation (Binary, Multi-Component) • Column Sizing and Tray Calculations • Reflux Ratio and Energy Optimization • Simulation and Hydraulic Checking*
0930 – 0945	*Break*

0945 – 1100	***Pump & Compressor Design Basics*** *Types and Selection Criteria • Head, Flow Rate, and Efficiency Curves • NPSH Calculations • Control and Protection Systems*
1100 – 1215	***Vessel & Reactor Design*** *Sizing of Separators and Knock-Out Drums • Pressure Vessel Design Codes (ASME Section VIII) • Reactor Types (CSTR, PFR) • Residence Time and Conversion Considerations*
1215 – 1230	*Break*
1230 – 1330	***Process Control Strategies*** *Process Control Loops and Configurations • PID Controller Tuning Basics • Safety Interlocks and Shutdown Systems • Interface with DCS/PLC*
1330 – 1420	***Process Safety Considerations*** *Relief and Flare System Basics • Hazard and Operability Study (HAZOP) • Layers of Protection (LOPA) • Fire and Gas Detection Design Basics*
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: ***Tuesday 25th of November 2025***

0730 – 0830	***Aspen HYSYS Interface & Navigation*** *Project Setup and Property Methods • Component Selection and Fluid Packages • Unit Operation Blocks • Convergence Strategies*
0830 – 0930	***Steady-State Simulation of Hydrocarbon Processes*** *Building Process Flowsheets • Input/Output Specification • Model Validation and Error Checking • Case Study: Natural Gas Dehydration*
0930 – 0945	*Break*
0945 – 1100	***Dynamic Simulation Basics*** *Difference Between Steady-State and Dynamic Simulation • Equipment Dynamics (Valves, Tanks, Columns) • Controller Tuning in Simulation • Case Study: Emergency Depressurization*
1100 – 1215	***Reaction Kinetics & Reactor Modelling*** *Defining Reaction Sets and Rate Expressions • Stoichiometry and Heat of Reaction • Plug Flow and CSTR Simulation • Case Study: Hydrodesulfurization Reactor*
1215 – 1230	*Break*
1230 – 1330	***Utilities & Supporting Systems Modelling*** *Steam Generation and Distribution • Cooling Water and Refrigeration Systems • Fuel Gas Network • Utilities Integration in Plant Models*
1330 – 1420	***Economic Evaluation in Simulation*** *Costing Equipment and Utilities • Profitability Indices (NPV, IRR, ROI) • Sensitivity Analysis • Economic Optimization of Process Routes*
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*

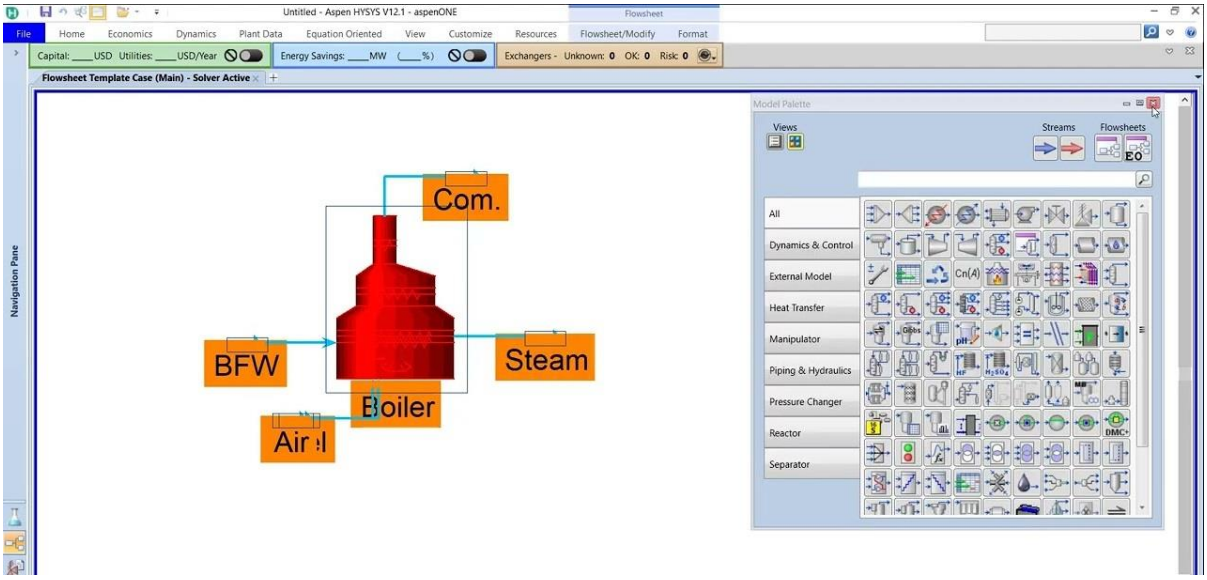
Day 4:	Wednesday 26th of November 2025
0730 – 0830	***Crude Oil Distillation & Blending*** *Atmospheric and Vacuum Distillation • Crude Assay and TBP Curves • Blending Operations and Optimization • Case Study Simulation*
0830 – 0930	***Gas Processing & NGL Recovery*** *Gas Sweetening and Dehydration • Cryogenic Processing • LPG/NGL Fractionation • Process Modelling in HYSYS*
0930 – 0945	*Break*
0945 – 1100	***Refinery Conversion Processes*** *Catalytic Reforming • Hydrocracking and FCC Basics • Coking Processes • Reactor Modelling and Sensitivity Checks*
1100 – 1215	***Process Integration & Pinch Analysis*** *Concept of Energy Integration • Pinch Point Identification • Heat Exchanger Network Synthesis • Tools for Process Integration*
1215 – 1230	*Break*
1230 – 1330	***Multiphase Separation & Flash Calculations*** *Three-Phase Separators • Flash Drum Modelling • Pressure and Temperature Effects • Optimization of Separation Units*
1330 – 1420	***Optimization Techniques in Process Design*** *Process Optimization Strategies • Objective Functions and Constraints • Solver Configuration • Case Study: Profit Maximization in a Refinery*
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:	Thursday 27th of November 2025
0730 – 0830	***Case Study: Designing a Gas Processing Plant*** *Defining Specifications • Building Process Simulation • Equipment Selection and Rating • Optimization and Reporting*
0830 – 0930	***Troubleshooting in Process Modelling*** *Common Modelling Errors • Convergence and Loop Issues • Debugging Dynamic Simulations • Validating Against Real Plant Data*
0930 – 0945	*Break*
0945 – 1030	***Debottlenecking & Capacity Expansion*** *Bottleneck Identification Methods • Simulation-Driven Capacity Analysis • Revamp Planning and Design • Cost-Benefit Analysis*
1030 – 1130	***Digital Transformation in Process Design*** *Digital Twins and Real-Time Modelling • Integration with Control Systems • Data Analytics and AI in Simulation • Case Study: Predictive Maintenance Integration*
1130 - 1215	***Environmental Compliance & Emissions Modelling*** *VOCs, NOx, SOx Emission Simulation • Wastewater and Effluent Modelling • Flaring Systems and Environmental Impact • Simulation Tools for ESG Reporting*

1215 – 1230	*Break*
1230 – 1345	***Project Documentation & Reporting*** *Generating Design Basis Documents • Simulation Report Writing • Equipment Datasheets and PFD Generation • Client Presentation Techniques*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t 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" simulator.



ASPEN HYSYS V12.1 Simulator

Course Coordinator

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