# COURSE OVERVIEW PE0025
# Polymers & Polymerization


**Course Title**
Polymers & Polymerization

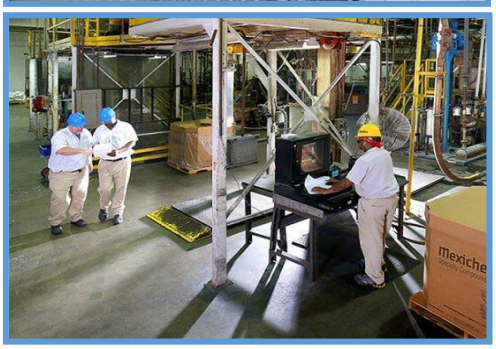
**Course Reference**
PE0025

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

**Course Date/Venue**

| Session(s) | Date | Venue |
|---|---|---|
| 1 | February 08-12, 2026 | Meeting Plus 9, City Centre Rotana, Doha Qatar |
| 2 | May 17-21, 2026 | Tamra Meeting Room, Al Bandar Rotana Creek, Dubai, UAE |
| 3 | August 03-07, 2026 | Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE |
| 4 | December 06-10, 2026 | Crowne Meeting Room, Crowne Plaza Al Khobar, an IHG Hotel, Al Khobar, KSA |

**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.***

Polymers and composites are widely used for a range of applications in engineering and technology. Selecting the correct material which is fit for purpose is a critical decision faced by engineers and scientists who do not necessarily have an in-depth knowledge of the chemistry or physics of polymers.

Polymers are macromolecules built up by linking large numbers of smaller molecules. Due to their diverse physical properties, polymers have become central to a number of important industries, including plastics, rubber, adhesives, fiber, composites and paint industries.

This course is designed to provide a good introductory to polymer and polymerization. It includes polymer basic definitions and concepts, and an overview of the basis for the various classifications of polymers. It also examines the requirements for polymer formation from monomers and discusses polymer structure at three levels: primary, secondary and tertiary. The relationship between the structure of monomers and properties of the resulting polymer is highlighted.

Throughout the discussions, emphasis is on the structure-property relationship and several examples are used to illustrate the concept.

The course provides a practical insight into the factors which influence the performance of a polymer or composite allowing informed selections to be made. The course covers polymer synthesis, polymer micro-structure and morphology, properties of polymers, plastic materials, processing of plastics, applications of plastics and polymer composites.

## Course Objectives

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

- Apply and gain an in-depth knowledge on polymers and polymerization technologies
- Identify the various types and classification of polymeric materials
- Recognize the importance of plastics, polyolefin and catalysts as well as identify the polymerization reactions, processes, stereo regularity and microstructural features
- Analyze polymer microstructure and morphology, molecular weight & its distributions and employ thermal analysis techniques
- Describe rheology, thermoplastics, thermosets and identify the mechanical properties of expanded plastics
- Discuss the coating systems and differentiate the process, application and classification between the polymer matrix composites and fibre reinforced polymer matrix composites
- Use and apply proper environmental practices in handling, sorting and separating the recycled plastics, biodegradable polymers and describe the short fibre reinforced PMCs

## 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 polymer and polymerization technology for researchers, chemists, engineers, physicists and those who work in or are beginning to work in this field. Further, managers in the polymer industry will greatly benefit from this in-depth course. No prior knowledge of polymer science is assumed.

## 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

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| Doha | **US$ 6,000** per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day. |
| Dubai | **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. |
| Abu Dhabi | **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. |
| Al Khobar | **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. |

## Accommodation

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

**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. Mervyn Frampton** is a **Senior Process Engineer** with over **30 years** of industrial experience within the **Oil & Gas**, **Refinery**, **Petrochemical** and **Utilities** industries. His expertise lies extensively in the areas of **Polymerization Processes**, **Polymers**, **Plastics**, **Polyolefin** & **Catalysts**, **Polymers** & **Polymerization**, **Polymerization Reactions**, **Biodegradable Polymers**, **Fibre Reinforced Polymer Matrix Composites**, **Polymer Microstructure** & **Morphology**, **Polymerization**, **Polyethylene**, **Polypropylene**, **Distillation Column** Operation & Control, **Oil Movement** Storage & Troubleshooting, **Process Equipment** Design, Applied **Process Engineering** Elements, **Process Plant** Optimization, **Revamping & Debottlenecking**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant** Monitoring, **Catalyst** Selection & Production Optimization, Operations Abnormalities & Plant Upset, **Process Plant** Start-up & Commissioning, **Clean Fuel** Technology & Standards, Flare, Blowdown & Pressure Relief Systems, **Oil & Gas Field Commissioning** Techniques, **Pressure Vessel** Operation, **Gas Processing**, **Chemical** Engineering, **Process Reactors** Start-Up & Shutdown, **Gasoline Blending** for Refineries, **Urea Manufacturing** Process Technology, Continuous Catalytic Reformer (**CCR**), **De-Sulfurization** Technology, Advanced Operational & Troubleshooting Skills, Principles of Operations Planning, **Rotating Equipment** Maintenance & Troubleshooting, **Hazardous Waste Management & Pollution Prevention**, **Heat Exchangers & Fired Heaters** Operation & Troubleshooting, **Energy Conservation** Skills, **Catalyst Technology**, **Refinery & Process Industry**, **Chemical Analysis**, **Process Plant**, **Commissioning & Start-Up**, **Alkylation**, **Hydrogenation**, **Dehydrogenation**, **Isomerization**, **Hydrocracking & De-Alkylation**, **Fluidized Catalytic Cracking**, **Catalytic Hydrodesulphuriser**, **Kerosene Hydrotreater**, **Thermal Cracker**, **Catalytic Reforming**, Pilot Water Treatment Plant, **Gas Cooling**, **Cooling Water Systems**, Effluent Systems, Material Handling Systems, **Gasifier**, **Gasification**, Coal Feeder System, **Sulphur Extraction Plant**, **Crude Distillation Unit**, **Acid Plant Revamp** and **Crude Pumping**. Further, he is also well-versed in HSE Leadership, Project and Programme Management, Project Coordination, Project Cost & Schedule Monitoring, Control & Analysis, Team Building, Relationship Management, Quality Management, Performance Reporting, Project Change Control, Commercial Awareness and Risk Management.

During his career life, Mr. Frampton held significant positions as the **Site Engineering Manager**, **Senior Project Manager**, **Project Engineering Manager**, **Construction Manager**, **Site Manager**, **Area Manager**, **Procurement Manager**, **Factory Manager**, **Technical Services Manager**, **Senior Project Engineer**, **Project Engineer**, **Assistant Project Manager**, **Handover Coordinator** and **Engineering Coordinator** from various international companies such as the **Fluor Daniel**, **KBR** South Africa, **ESKOM**, MEGAWATT PARK, CHEMEPIC, PDPS, CAKASA, **Worley Parsons**, Lurgi South Africa, **Sasol**, **Foster Wheeler**, **Bosch** & **Associates**, **BCG** Engineering Contractors, Fina Refinery, Sapref Refinery, Secunda Engine Refinery just to name a few.

Mr. Frampton has a **Bachelor's degree** in **Industrial Chemistry** from **The City University** in **London**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**) and has delivered numerous trainings, courses, workshops, conferences and seminars 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***

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| *0730 – 0800* | *Registration & Coffee* |
| *0800 – 0815* | *Welcome & Introduction* |
| *0815 – 0830* | ***PRE-TEST*** |
| *0830 – 0930* | ***Introduction to Polymers***<br>*Polymers –Types ● Part of The Ethylene Chain ● Petrochemicals from Ethylene ● Petrochemicals from Propylene ● Petrochemicals from Butadiene ● Petrochemicals from Xylenes ● General Classes of Polymers ● Vocabulary ● Polymers-The Journey ● Polymers- Finger Prints ● A History of Development of Polymers ● A Classification of Polymeric Materials ● Introduction to Polymers* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***Plastics, Polyolefin & Catalysts***<br>*Amorphous ● Semi-crystalline ● Co-Polymers ● Additives ● Types of Plastics ● Thermoplastic vs. Thermoset ● Technology S-curves for Polyolefin Production ● Z-N Catalysts- Generations Catalyst* |
| *1100 – 1215* | ***Plastics, Polyolefin & Catalysts (cont'd)***<br>*General Composition of Catalyst System ● Evolution of Single Site Catalysts ● PP- Streochemistry Vs Properties ● Ploy Ethylene – Types Vs Properties ● Polyethylene (HDPE) ● Polymerization Process ● Methods of Polymer Fabrication* |
| *1215 – 1230* | *Break* |
| *1230 – 1420* | ***Polymerization Reactions***<br>*Free Radical Polymerization – Ethylene ● Polyethylene (LDPE) ● Surface Structure of Chromium Based PE Catalysts ● Conventional Ziegler-Natta Catalyst ● Z-N Polymerization-Stereochemistry ● PP Stereochemistry- Effect of Metal & Ligand ● Polymerization of Propylene- Reaction Scheme* |
| *1420 – 1430* | ***Recap***<br>*Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow* |
| *1430* | *Lunch & End of Day One* |

***Day 2***

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|---|---|
| *0730 – 0900* | ***Polymerization Reactions (cont'd)***<br>*Polymerization of Propylene – Steps ● PP- Streochemistry Vs Properties ● Condensation (step-growth) polymerization ● A Comparison of Polymerisation Reactions ● Step-Growth Polymerisation ● Comparison of Step-Reaction & Chain-Reaction Polymerization ● History of PE & PP* |
| *0900 – 0915* | *Break* |
| *0915 – 1100* | ***Polymerization Processes***<br>*Bulk Polymerization ● Solution Polymerization ● Precipitation Polymerization ● Suspension Polymerization ● Emulsion Polymerization ● Comparison of Polymerization Methods* |
| *1100 – 1230* | ***Stereoregularity & Microstructural Features***<br>*Isotactic PP ● Atactic PP ● Syndiotactic PP ● Morphology in Crystalline Thermoplastics ● Network Molecules* |

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| *1230 – 1245* | *Break* |
| *1245 – 1420* | ***Polymer Microstructure & Morphology***<br>*Lamellar Thickness Measurement by SAXS ● Determination of Crystallinity ● Density Method ● Infra-red (I.R.) Method ● Thermal Analysis Method* |
| *1420 – 1430* | ***Recap***<br>*Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow* |
| *1430* | *Lunch & End of Day Two* |

***Day 3***

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| *0730 – 0930* | ***Polymer Microstructure & Morphology (cont'd)***<br>*Determination of the Degree of Molecular Orientation in Polymers ● Birefringence ● Sonic Techniques ● X-ray Diffraction ● Infra-red Method* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***Molecular Weight & Molecular Weight Distributions***<br>*Influence on Properties ● Cohesive Energy Density ● Solubility Parameter* |
| *1100 – 1215* | ***Thermal Analysis Techniques***<br>*Differential Scanning Calorimetry (DSC) ● Thermogravimetric Analysis (TGA) ● Dynamic Mechanical Thermal Analysis (DMTA or DMA) ● Thermomechanical Analysis (TMA)* |
| *1215 – 1230* | *Break* |
| *1230 – 1420* | ***Rheology***<br>*Table: Typical Viscosity Values ● Figure: Variation of Apparent Viscosity with Shear Rate ● Figure: Newtonian & Non-Newtonian Behaviours* |
| *1420 – 1430* | ***Recap***<br>*Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow* |
| *1430* | *Lunch & End of Day Three* |

***Day 4***

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| *0730 – 0930* | ***Thermoplastics***<br>*Thermoplastic Types ● Polyethylenes ● Polypropylene ● Polyvinylchloride (PVC) ● Polystyrene (PS) ● Nylons ● Processing & Forming Methods for T/Ps ● Vacuum Forming* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***Thermosets***<br>*Polyester Resins (Unsaturated) ● Amino Resins ● Phenol-Formaldehyde Plastics ● Applications of PF ● Processing Methods of Thermosetting Polymers* |
| *1100 – 1215* | ***Expanded Plastics***<br>*Polyurethane Foam (PU) ● Raw Materials for Producing PU Foams ● Processing ● Mechanical Properties of Foams* |
| *1215 – 1230* | *Break* |
| *1230 – 1420* | ***Coating Systems***<br>*Drying & Hardening Processes ● Coating Techniques* |
| *1420 – 1430* | ***Recap***<br>*Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today & Advise Them of the Topics to be Discussed Tomorrow* |
| *1430* | *Lunch & End of Day Four* |

***Day 5***

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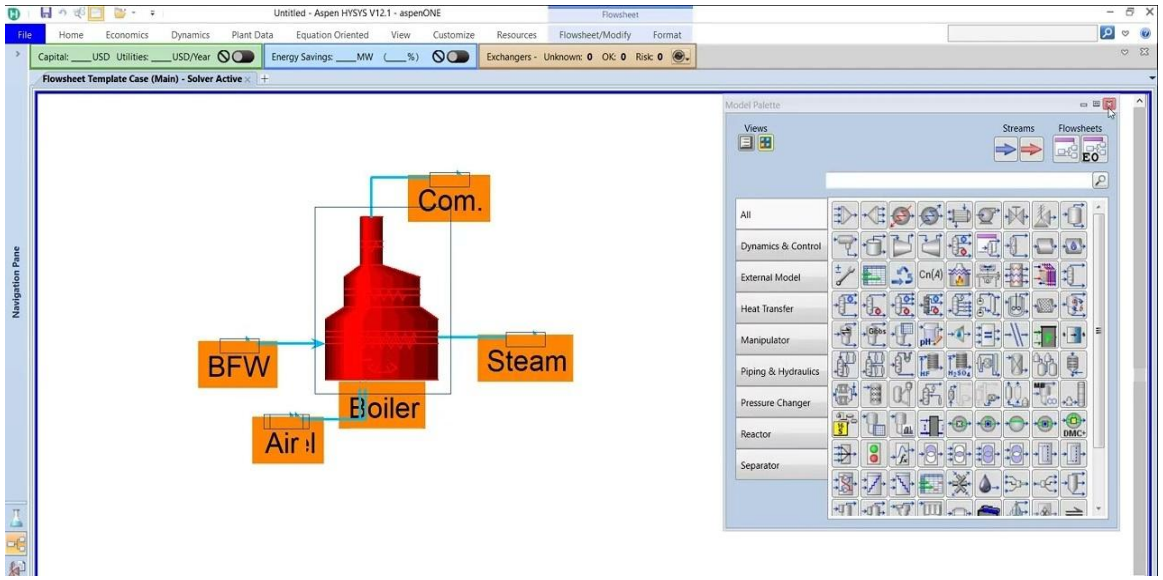
| *0730 – 0930* | ***Polymer Matrix Composites***<br>*A Classification of Composites ● Particulate Filled Polymers* |
| *0930 – 0945* | *Break* |
| *0945 – 1100* | ***Fibre Reinforced Polymer Matrix Composites***<br>*Thermal & Curing Stresses in Composites ● Estimation of Mechanical Properties ● Anisotropy in Tensile Strength of UD Composites* |
| *1100 – 1200* | ***Short Fibre Reinforced PMCs***<br>*Transfer of Stress from Matrix to Fibres & the Concept of Critical Fibre Length ● Short-fibre Reinforced Thermoplastics ● In-service Considerations for Composites* |
| *1200 – 1215* | *Break* |
| *1215 – 1345* | ***Recycling***<br>*Recycling of Plastics ● Handling/Sorting/Separation ● Recycling Codes for Common Thermoplastics ● Biodegradable Polymers ● Incentives for Companies to Apply Good Environmental Practices* |
| *1345 – 1400* | ***Course Conclusion***<br>*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 "ASPEN HYSYS V12.1" simulator.




**ASPEN HYSYS V12.1 Simulator**

## Course Coordinator

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