MERCURY

Fundamentals of Chemical Engineering Solution & Refresher Course

16 – 20 November 2026
Madrid (Spain)



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Ref: 6027_300558 **Date:** 16 – 20 November 2026 **Location:** Madrid (Spain) **Fees:** 6200 Euro

Introduction

Chemical engineering is at the core of various industries, including the chemical, oil, gas, and petrochemical sectors. Chemical engineers are key players in the transportation and conversion of material in all states of matter. Still, it's crucial that they also possess knowledge of other engineering fields, such as mechanical, electrical, and instrumentation. Central to chemical engineering are separation processes like distillation, as well as heat transfer, hydraulics and fluid flow, reaction engineering, process control, and understanding of economics. These represent the practical fundamentals of chemical engineering.

This fundamentals of chemical engineering solution and refresher course is designed to explore common areas within chemical engineering to offer both fundamental knowledge to those new to the field and a valuable refresher to seasoned professionals. Real-world examples from diverse processing industries, which include but are not limited to oil and gas processing, petrochemicals, and chemical manufacturing, will be studied.

Targeted Groups

- Petrochemical Engineers.
- Chemical Engineers.
- Plant Engineers.
- Consulting Engineers.
- Engineering Managers.
- Maintenance Engineers/Technicians.
- Project Engineers.
- Process Control Engineers.

Course Objectives

By the end of this fundamentals of chemical engineering solution and refresher course, participants will be able to:

- Interpret flowsheets and process flow diagrams.
- Apply mass and energy balances in process design.
- Understand fluid flow basics, including pumping and mixing.
- Analyze examples from the oil and gas industry.
- Design heat exchangers and compare different types.
- Grasp distillation and separation methods used in oil and gas processing.
- Be aware of the industry's role in controlling environmental pollution.
- Implement process control techniques.

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- Conduct a rudimentary economic project analysis.

Targeted Competencies

At the end of this fundamentals of chemical engineering solution and refresher course, the target competencies will be able to:

- Design of transfer equipment, primarily heat exchangers.
- Application of mass and energy balances in design processes.
- Effluent minimization and treatment strategies.
- Process control techniques.
- Economic analysis of project basics.

Course Content

Unit 1: Process Engineering Fundamentals

In this unit, you will understand the practical fundamentals of chemical engineering:

- Fundamental principles of chemical engineering.
- Interpretation of flow diagrams.
- Understanding Piping and Instrumentation Diagrams P&IDs.
- Introduction to process equipment.
- Fundamentals of mass and energy balances.
- Batch versus continuous processes.
- Risk assessments and hazard studies in chemical engineering.
- Flammability and electrical area classification in the process industries.

Unit 2: Practical Fundamentals of Chemical Engineering: Fluid Flow

Understanding the principles of fluid dynamics is critical in chemical engineering. This unit delves into:

- The relationship between pressure and head.
- Bernoulli's Theorem and its implications.
- Fundamental aspects of the flow of liquids.
- Significance of Reynolds number and pressure drop calculations in pipelines.
- The nature of compressible flow.
- Preliminary thermodynamics.
- Complexities of two-phase and multi-phase flow.
- Process relief devices and systems design principles.
- Operation of pumps and compressors.

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- Techniques in mixing utilizing various mixers.

Unit 3: Heat Transfer and Reaction Engineering Solutions

The transfer of heat and the engineering of chemical reactions are pivotal concepts that will be explored:

- Thermal conductivity and its role in materials.
- The mechanisms of conduction and convection.
- Insulation techniques and materials.
- Understanding heat transfer coefficients.
- Categories and sizing of heat exchangers.
- Basics of chemical reactions.
- Reaction kinetics.
- An overview of catalysis and the principles of green chemistry.

Unit 4: Introduction to Separation Processes

Distillation and separation processes are critical in many aspects of chemical engineering:

- The founding principles of distillation.
- Vapor/liquid equilibria and its effect on phase behavior.
- A look at various distillation equipment.
- Troubleshooting common issues with distillation.
- Gas/Liquid separation methods.
- Insights into absorption and adsorption processes.
- Techniques for solid-liquid separation.
- Strategies for controlling air and water pollution.
- Approaches to effluent treatment in process industries.

Unit 5: Process Control and Economics Basics

Control and economics play a significant role in the efficiency and viability of chemical processes:

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- Examination of measured variables in processes.
- Fundamentals of simple feedback control.
- Understanding of Safety Integrity Level SIL and Safety Instrumented Systems SIS.
- Basics of process utilities
- air.
- Water and cooling water systems.
- Steam.
- Review of electricity and power generation within process plants.
- Introduction to the principles of process economics.
- Conducting preliminary economic analysis.
- Comprehending fixed versus variable costs and determining break-even points.
- Calculation of raw materials usage and optimization.
- The six-tenths rule and other scale-up considerations.
- Estimating costs associated with process equipment and overall plant operations.