

Chemical Engineering Fundamentals for Non-Chemical Engineers Course

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Overview

Chemical Engineering Fundamentals for Non-Chemical Engineers Course is a one-week foundation programme for professionals who need to interpret process information, communicate across disciplines and make better technical decisions without performing specialist chemical-engineering design. Participants work with process flow diagrams, material and energy balances, thermodynamic concepts, fluid behaviour, heat and mass transfer, separation operations, reaction basics, control interfaces, process safety and structured troubleshooting. Agile Leaders Training Center develops practical process literacy for multidisciplinary facility teams.

Who Should Attend

- Mechanical and maintenance engineers supporting process equipment
- Electrical and instrumentation engineers working with process control systems
- Civil, project and construction engineers delivering process facilities
- Safety and reliability professionals reviewing operational risk
- Commercial, planning and technical-service professionals requiring process context

No chemical-engineering qualification is required. The course uses practical calculations and diagrams while excluding advanced reactor design, detailed equipment sizing and specialist process simulation.

Departments and Industries

The course supports cross-functional work wherever physical and chemical transformations occur.

- Oil, gas, refining and petrochemical operations
- Chemical, fertilizer and industrial manufacturing
- Water treatment, utilities and environmental services
- Food, pharmaceutical and materials processing
- Engineering, procurement, construction and technical consulting

Learning Objectives

By the end of this course, participants will be able to:

- Read process flow diagrams and identify major process functions
- Construct simple material and energy balances around equipment
- Explain how pressure, temperature and phase behaviour affect operations
- Relate fluid flow, heat transfer and mass transfer to equipment performance
- Compare common separation and reaction-system purposes
- Interpret control loops, safeguards and basic troubleshooting evidence

Course Agenda

Day 1: Process Language, Diagrams and Balances

- Process Boundary, Stream and Unit-Operation Map
- Block Flow Diagram and Process Flow Diagram Reading Method
- Mass, Mole, Composition and Flow-Rate Conversion Sheet
- Steady-State Material Balance around Mixers and Separators
- Energy Balance and Utility-Demand Worksheet

Day 2: Thermodynamics and Fluid Flow

- Pressure, Temperature, Enthalpy and Phase-Behaviour Guide
- Vapour-Liquid Equilibrium and Boiling-Condensation Interpretation
- Density, Viscosity and Reynolds-Number Decision Map
- Pressure Drop through Pipe, Valve and Fitting Systems
- Pump, Compressor and Flow-Control Interface Checklist

Day 3: Heat, Mass Transfer and Separation

- Conduction, Convection and Overall Heat-Transfer Path
- Heat-Exchanger Duty, Temperature Approach and Fouling Review
- Diffusion and Interphase Mass-Transfer Concept Map
- Distillation, Absorption, Extraction and Adsorption Selection Guide
- Filtration, Drying and Membrane Separation Comparison

Day 4: Reactions, Control and Process Safety

- Reaction Rate, Conversion, Yield and Selectivity Worksheet
- Batch, Continuous and Catalytic Reactor Purpose Comparison
- Measurement, Controller and Final-Control-Element Loop Map
- Operating Window, Alarm, Interlock and Relief-Layer Review
- Hazard Identification and Process-Deviation Discussion Method

Day 5: Operations, Troubleshooting and Integration

- Exercise: Trace Material and Energy through a Process Flow Diagram
- Exercise: Diagnose Pressure-Drop and Heat-Transfer Symptoms
- Exercise: Compare Separation and Reaction Operating Choices
- Exercise: Review Control Response and Safeguard Evidence
- Capstone Exercise: Complete a Multidisciplinary Process Understanding Workbook

Practical Exercises

The course uses suggested activities that connect core principles with operating evidence and cross-functional decisions.

- Suggested activity: annotate streams, equipment and control points on a process flow diagram
- Suggested activity: close simple material and energy balances and test assumptions
- Suggested activity: relate equipment symptoms to fluid, thermal and separation causes
- Suggested activity: assemble a process narrative, risk review and troubleshooting plan

FAQs

Who suits this chemical engineering fundamentals course?

It suits engineers, technical specialists, safety staff, project teams and commercial professionals who work with process facilities but do not have a chemical-engineering background.

How much calculation is included?

Participants use practical unit conversions, material and energy balances, pressure-drop concepts, heat duties and reaction measures. The focus is interpretation rather than advanced design mathematics.

Does the course teach process simulation software?

No. It builds the principles needed to understand model inputs and outputs, but detailed simulation and specialist equipment design remain outside the foundation scope.

How is this different from advanced reactor training?

This course surveys the full process system for a multidisciplinary audience. Advanced reactor training concentrates on reaction engineering, kinetics and reactor design at specialist depth.

What practical output do participants complete?

Participants complete a Multidisciplinary Process Understanding Workbook combining diagrams, balances, equipment interfaces, control observations, safeguards and troubleshooting evidence.

Conclusion

Participants leave with a structured way to read process information and connect chemical-engineering principles to equipment, controls, safety and operations. The workbook supports clearer technical conversations, assumption checks and problem definition across disciplines. It provides a reusable foundation for participating in reviews, investigations and facility decisions.

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