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Process Engineering

Course Content



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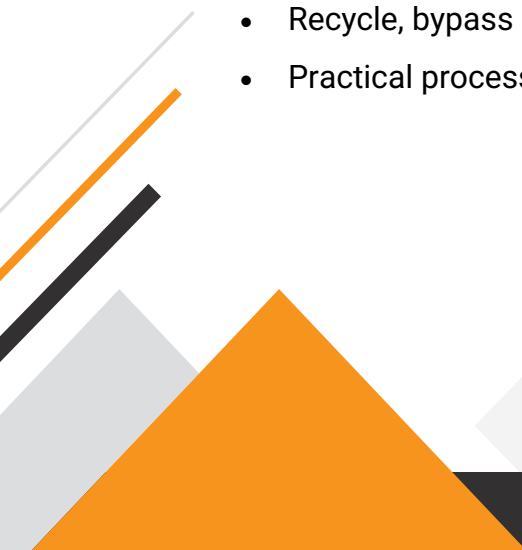
Module 1: Introduction to Process Engineering

- Role and responsibilities of a Process Engineer
- Process engineering lifecycle
- Process industries and applications
- Engineering project phases
- FEED, Basic Engineering and Detailed Engineering
- Process engineering documents and deliverables

Module 2: Process Design Fundamentals

- Process design basis
- Design criteria and operating philosophy
- Process variables: pressure, temperature, flow and composition
- Steady-state process concepts
- Material properties and phase behaviour
- Design and operating conditions

Module 3: Material and Energy Balances

- Principles of mass balance
 - Component and overall material balances
 - Energy balance fundamentals
 - Heat and work calculations
 - Recycle, bypass and purge calculations
 - Practical process balance problems
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Module 4: Process Flow Diagrams (PFDs)

- Purpose and structure of PFDs
- Process equipment representation
- Process streams and stream numbering
- Operating parameters
- Heat and material balance data
- Reading and reviewing PFDs

Module 5: Piping & Instrumentation Diagrams (P&IDs)

- P&ID symbols and conventions
- Equipment, piping and instruments
- Control valves and isolation valves
- Process control loops
- Utility and process connections
- P&ID development and review methodology
- P&ID mark-up exercises

Module 6: Fluid Flow and Hydraulic Calculations

- Fluid properties
- Bernoulli equation
- Pressure-drop calculations
- Pipe sizing principles
- Flow regimes and Reynolds number
- Friction losses and fittings
- Liquid and gas line sizing
- Hydraulic network considerations

Module 7: Pumps and Compressors

- Centrifugal and positive displacement pumps
- Pump head and system curves
- NPSH and cavitation
- Pump sizing and selection
- Compressor fundamentals
- Types of compressors
- Compressor performance considerations
- Equipment datasheet preparation

Module 8: Heat Transfer and Heat Exchangers

- Heat-transfer fundamentals
- Conduction, convection and radiation
- Overall heat-transfer coefficient
- Heat exchanger types
- Shell-and-tube heat exchangers
- Heat duty calculations
- Preliminary exchanger sizing
- Fouling and pressure-drop considerations

Module 9: Process Equipment Design Fundamentals

- Pressure vessels
 - Separators and drums
 - Storage tanks
 - Columns and towers
 - Filters and process packages
 - Equipment sizing considerations
 - Process equipment datasheets
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- Design pressure and temperature

Module 10: Process Control and Instrumentation

- Fundamentals of process control
- Pressure, temperature, flow and level measurement
- Control loops
- Control valve fundamentals
- Process alarms and trips
- Interlocks and shutdown philosophy
- Basic cause-and-effect concepts

Module 11: Process Safety and Relief Systems

- Process safety fundamentals
- Hazard identification
- HAZID and HAZOP concepts
- Relief scenarios
- Pressure safety valves
- Relief load fundamentals
- Flare and vent systems
- Emergency shutdown considerations
- Process safety documentation

Module 12: Process Engineering Deliverables & Practical Project

- Process design basis preparation
- Heat and material balance
- PFD preparation and review
- P&ID preparation and review
- Equipment sizing calculations

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- Equipment datasheets
 - Line sizing and hydraulic calculations
 - Process equipment list and line list
 - Utility requirements
 - Process control philosophy
 - HAZOP participation
 - Interdisciplinary engineering coordination
 - Practical process engineering case study/project
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