

Scandinavian Academy
Training Center

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# Course: Chemical Engineering for Non_Chemical Engineers

| Code | City | hotel | Start | End | price | Language - Hours |
|---|---|---|---|---|---|---|
| CM-551SA | Al Baha | Hotel Meeting | 2027-09-05 | 2027-09-16 | 22950 SR | En - 50 |

## Course Overview

This course is aimed at non-chemical engineers who need an overview of the function, principles, requirements, and operation of typical chemical process equipment and who need to communicate effectively with chemical / process engineers by gaining a basic understanding of the operational factors and design equations that are used by chemical engineers and how chemical engineering relates to their disciplines.

## What you will learn

- Role, need, and goal of chemical engineering in today’s world
- Three elements of process plants including equipment, utilities, and instrumentation and control
- Process engineers knowledge Concepts, Skills, Deliverables, Codes & Standards
- Process engineering concepts related to two main elements of chemical engineering; material and material changes; including: different material phases (solid, liquid and gas), fluid properties, gas law, material properties, physical operations vs. chemical processes, etc.
- Different process discipline deliverables including: BFD, PFD, P&ID, H&MB Table, process design criteria and process design basis, process description, process control narrative, and cause and effect table and gaining ability to read and interpret them
- Concepts and applications of different process elements including: pipes, valves, automatic valves (switching valves and control valves), containers (vessels and tanks), fluid movers (pumps, compressors, blowers, fans), heat exchangers, and furnaces

- Common principles of “change” either physical or chemical
- Different unit operations including Gravity Separation, Filtration, Absorption & Adsorption, Evaporation, Distillation, Crystallization, Centrifugation, Drying, Extraction, Leaching, Membrane separation, Cyclones, Humidification, and Dehumidification
- Safety requirements of process plant and technical and legal issues related to Pressure Relief Devices (PRD) including Pressure Safety Valves (PSV) and rupture discs in the process plants
- Impact of process plants on three elements of environment, air, water, and soil
- Risk management and risk management tools in process industries including HAZOP
- Profitability of process plants including capital, operating cost, and unit product cost estimation
- Material of construction in process plants and different mechanisms of material loss including corrosion and erosion.

# Course Outline

### Day 1

### Chemical Engineering

- What is this course about?
- What is chemical engineering about?
- What do chemical engineers study in university and why?
- Which sectors do chemical engineers work in?
- Different types of Process industries
- What do we need to study to learn chemical engineering quickly?
- Process Plants: A tangible way to start learning chemical engineering
- Process Plant Elements: Equipment, Utility Generation & Network, and Instrumentation & Control (I&C)

## Day 2

### Process Industries Elements: Equipment and Pipes (Applications)

- Fluid Conductors: Pipes, Tubes, Ducts
- Pipe Appurtenances: Fitting and Valves
- Fluid Movers: Pumps and Compressors
- Containers: Tanks, Vessels
- Heat Transfer Equipment: Heat Exchangers, Furnaces
- Unit Operations and Unit Processes

### Process Industries Elements: Utility

- Different Utilities in Plants
- Utilities Generation
- Utility Distribution and Collection Networks
- Permanent vs. Temporary Utility Users

## Day 3

### Process Industries Elements: Instrumentation and Control

- The Value of Control; and Parameters of Interest
- Three Layers of Integrated Control & Safety System (ICSS): BPCS, Alarm, and SIS
- Control Loop: Duty and Components
- Three Main Elements of Control Loops: Control Architecture, Control Strategy, and Tuning
- Primary Elements: Sensors and Meters
- Final Elements: Control Valves
- Safety Instrumented Function: Duty and Components
- Final Elements: Switching Valves
- Alarm System: Duty and Components

## Day 4

## Chemical Engineers` Assets - Part 1

- Chemical Engineers` Assets: Concepts, Skills, Deliverables, Codes & Standards
  - A - Process Engineering Discipline Deliverables
    - BFD (Block Flow Diagram)
    - PFD (Process Flow Diagram)
    - Plot Plan; and Site Selection
    - P&ID (Piping & Instrumentation Diagram)
    - H&MB Table (Heat & Material Balance)
    - Equipment Datasheets
    - Process Description and Process Control Narrative
    - Datasheets
    - Utility Consumption Table
    - Chemical Consumption Table
    - Shut-Down Key Table
    - Alarm Set Point Table
  - B - Process Engineers` Skills
    - Calculation
    - Study Report
    - SOP (Standard Operating Procedure)
    - Scope Definition Document
  - C - Process Engineering Standards and Codes
    - Standards vs. Codes
    - Common Standards in Chemical Engineering
    - Common Codes in Chemical Engineering
  - D - Process Engineering Concepts

## Day 5

## Substances

- Material Phases: Solids, Liquids, and Gasses
    - Phase Behaviour
    - Gas Laws
    - Material Properties
    - Properties of Flowable Solids
    - Change: Physical or Chemical
    - Physical Change: Macro-Change, Micro-Change (Phase and Component Changes)
    - Chemical Change: Reactions
- Principles of Material Change
    - Mass Transfer and Energy Transfer (Potential and Kinetic)
    - Transfer Phenomena: Heat Transfer, Mass Transfer; and Momentum Transfer
    - Conservation of Energy, Mass; and Momentum
    - Energy Balance, Mass Balance

**Day 6**

**Process Industries Elements: Equipment and Pipes (Concepts)**

- Fluid Conductors: Pipes, Tubes, Ducts
- Fitting and Valves
- Fluid Movers: Pump and Compressors
- Containers: Tanks, Vessels
- Mixing and Agitation
- Heat Transfer Equipment: Heat Exchangers, Furnaces
- Unit Operations and Unit Processes
- Flowable Solid Transfer

**Day 7**

**Common Principles of Change**

- Type of change: Physical or chemical
- Possibility (thermodynamic) and speed (Kinetics)
- End point vs. equilibrium point
- Phase equilibrium and Reaction equilibrium
- Containers for “change"

**Unit Operations: Solid Handling**

- Size reduction (comminution)
- Crushers
- Grinders

**Day 8**

**Unit Operations: Separation Methods - Part 1**

- Screening
- Gravity Separation
- Filtration
- Absorption & Adsorbtion
- Evaporation
- Distillation
- Crystallization
- Centrifugation
- Drying
- Extraction
- Leaching
- Membrane
- Cyclones
- Cooling Towers, Humidification, and Dehumidification

**Day 9**

## Process Units: Reactions

- What is a reactor?
- Different types of reactors: Plug and Mixed
- Single Phase vs. Multiphase
- Endothermic vs. Exothermic

## Day 10

## Process Plant Design

- Batch vs. Continuous
- Steady State vs. Unsteady State
- Hierarchy of Document Generation
- Simulation
- Sizing vs. Specification
- Series and Parallel Process Items

**The Scandinavian Academy for Training Center** adopts the latest scientific and professional methodologies in training and human resource development, aiming to enhance the efficiency of individuals and organizations. Training programs are delivered through a comprehensive approach that includes:

- Theoretical lectures supported by PowerPoint presentations and visual materials (videos and short films).
- Scientific evaluation of participants before and after the program to measure progress and knowledge acquisition.
- Brainstorming sessions and practical role-playing to simulate real-life scenarios.
- Case studies tailored to align with the training content and participants work nature.
- Assessment tests conducted at the end of the program to evaluate the achievement of training objectives.

Each participant receives the training material (both theoretical and practical) in printed form and saved on a CD or flash drive. Detailed reports, including attendance records, final results, and overall program evaluations, are also provided.

Training materials are prepared professionally by a team of experts and specialists in various fields. At the end of the program, participants are awarded a professional attendance certificate, signed and accredited by the Scandinavian Academy for Training Center.

**Program Timings:  9:00 AM to 2:00 PM**

**The program includes:**

- A daily buffet provided during the sessions to ensure participants comfort.
- A closing ceremony on the final day to distribute certificates and celebrate participants achievements.
- **Note: All prices are exclusive of 15% Value Added Tax (VAT).**

# Our Success Partners

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