



Chemical, Mechanical Engineering



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Course: Chemical Engineering for Non_Chemical Engineers

Code	City	hotel	Start	End	price	Hours
551	Florence (Italy)	Hotel Meeting Room	2024-07-01	2024-07-12	7950 €	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 & Adsorption
- 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 employs modern methods in training and skills development, enhancing the efficiency of human resource development. We follow these practices:

- **Theoretical Lectures:**
 - We deliver knowledge through advanced presentations such as PowerPoint and visual materials, including videos and short films.
- **Scientific Assessment:**
 - We evaluate trainees skills before and after the course to ensure their progress.
- **Brainstorming and Interaction:**
 - We encourage active participation through brainstorming sessions and applying concepts through role play.
- **Practical Cases:**
 - We provide practical cases that align with the scientific content and the participants specific needs.
- **Examinations:**
 - Tests are conducted at the end of the program to assess knowledge retention.
- **Educational Materials:**
 - We provide both printed and digital scientific and practical materials to participants.
- **Attendance and Final Result Reports:**
 - We prepare detailed attendance reports for participants and offer a comprehensive program evaluation.
- **Professionals and Experts:**
 - The programs scientific content is prepared by the best professors and trainers in various fields.
- **Professional Completion Certificate:**
 - Participants receive a professional completion certificate issued by the Scandinavian Academy for Training and Development in the Kingdom of Sweden, with the option for international authentication.
- **Program Timings:**
 - Training programs are held from 10:00 AM to 2:00 PM and include buffet sessions for light meals during lectures.