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For Training and Development

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Course: Chemical Engineering for Non_Chemical Engineers

| Code | City | Hotel | Start | End | Price | Language - Hours |
|------|------------------|--------------------|------------|------------|--------|------------------|
| 551 | Dublin (Ireland) | Hotel Meeting Room | 2025-02-10 | 2025-02-21 | 9450 € | 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 & 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 for Training and Development 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 coffee break sessions during lectures.