



**Chemical, Mechanical Engineering**



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# Course: Fundamentals of Chemical Engineering

Code	City	hotel	Start	End	price	Hours
135	Frankfurt (Germany)	Hotel Meeting	2024-05-20	2024-05-24	5450 €	25

## INTRODUCTION

Chemical engineering is at the heart of much of the chemical, oil, gas, and petrochemical industries. The chemical engineer is interested in the transportation and transformation of solids, liquids and gases, but must also be familiar with many of the other engineering disciplines including mechanical, electrical and instrumentation. Of specific importance are separation processes including distillation, heat transfer, hydraulics and fluid flow, reaction engineering, but also process control and economics. These are the fundamental principles of chemical engineering.

This programme considers the areas of chemical engineering that are most commonly encountered, and will provide an understanding of the fundamentals to the non-specialist, and a refresher to practising engineers, with examples that will be drawn from a range of process industries including oil and gas processing, petrochemicals, chemical manufacturing. In this programme you will:

- Learn to interpret flowsheets and process flow diagrams
- Develop and understand mass and energy balances in process design
- Learn about fluid flow, pumps and compressors, and mixing
- Discuss heat transfer equipment and their design, including heat exchangers
- Understand distillation and separations used in oil and gas processing
- Discuss effluent minimisation and treatment
- Learn how to control processes
- Perform a basic economic analysis of a project
- Understand the safety and environmental responsibility on process engineer

## PROGRAMME OBJECTIVES

Using case studies from the oil, gas and chemical industry to illustrate the material, participants attending the programme will:

- Learn to interpret flowsheets and process flow diagrams
- Understand the use of mass and energy balances in process design
- Gain a basic understanding of fluid flow, including pumping and mixing
- Study examples relevant to the oil and gas industry
- Design a heat exchanger and know advantages/disadvantages of different types
- Understand distillation and separations used in oil and gas processing
- Appreciate the need to control environmental pollution from industry



- Learn how to control processes
- Perform a basic economic analysis of a project

## TRAINING METHODOLOGY

In addition to formal lectures, videos and discussions, the participants will learn by active participation through the use of problem-solving exercises, group discussions and analysis of real-life case studies.

## PROGRAMME SUMMARY

This programme identifies the areas of chemical engineering that are most commonly encountered and are fundamental to its understanding, enhancing process design and operation and enabling fruitful dialogue between the non-specialist and the engineer. Programme examples will be drawn from a range of process industries including the oil and gas processing, petrochemicals and chemical manufacturing industries.

## PROGRAMME OUTLINE

### Process Engineering Fundamentals

- Introduction
- Basic Concepts to remember
- Flow diagrams
- Piping and Instrumentation Diagrams (P&IDs)
- Process equipment
- Introduction to mass and energy balances
- Batch vs Continuous
- Risk Assessments and Hazard Studies
- Flammability and Electrical Area Classification
- Workshop Session

### Fluid Flow

- Pressure and Head
- Bernoulli's Theorem
- Flow of Liquids
- Reynolds number, pressure drop in pipes
- Compressible flow
- Introduction to Thermodynamics
- Two-phase and Multi-phase Flow
- Principle of process relief devices and process design of relief systems
- Pumps and Compressors



- Mixing and Mixers
- Workshop Session

## **Heat Transfer**

- Thermal conductivity
- Conduction and convection
- Insulation
- Heat transfer coefficients
- Heat exchangers, type and sizing
- Chemical reactions
- Reaction kinetics
- Introduction to catalysis and Green Chemistry
- Workshop session

## **Introduction To Separation Processes**

- Distillation basics
- Phase behaviour and vapour/liquid equilibria
- Distillation Equipment
- Distillation Troubleshooting
- Gas/Liquid separation
- Absorption and adsorption
- Solid Liquid separation
- Air and water pollution control
- Effluent treatment
- Workshop Session

## **Process Control & Economics Basics**

- Measured variables
- Simple feedback control
- SIS and SIL
- Process Utilities
- Air
- Water and cooling water
- Steam
- Electricity and power generation
- Process Economics
- Preliminary economic analysis
- Fixed and variable costs, break even
- Calculating raw materials usage
- Scale up and six tenths rule



- Estimating the cost of process equipment and plants



**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.