

Introduction

Chemical Engineering is a diverse field that incorporates principles from physics, chemistry, applied mathematics, and economics to process, produce, transport, and manage chemicals, materials, and energy. A key element of this field is plant design, which focuses on creating efficient, functional, and safe facilities that deliver products or services effectively.

Chemical engineers utilize their expertise to transform raw materials into valuable products such as pharmaceuticals, fuels, chemicals, and plastics. This is achieved through both manufacturing processes and innovative research aimed at improving production methods, reducing environmental impacts, and conserving resources.

Target Audience

- Chemical Engineers
- Plant Engineers
- Petrochemical Engineers
- Consulting Engineers
- Engineering Managers
- Maintenance Engineers/Technicians
- Project Engineers
- Process Control Engineers

Course Objectives

By the end of this course, participants will:

- Gain an understanding of the technical concepts involved in chemical plant design and layout.
- Develop insights into process and piping design, with a focus on their application in chemical engineering plants.
- Enhance their knowledge of core chemical engineering theories and concepts within the context of working chemical engineering plants.

Targeted Competencies

By the end of the training, participants will have:

- An understanding of **control valve manifolds**.
- Familiarity with common abbreviations used in chemical plant engineering.
- A grasp of **fluid properties** essential for preliminary chemical plant design.

- Knowledge of **volume and velocity** in fluid systems.
- Recognition of **symbols** used in chemical engineering plant design software.

Understanding Plant Design in Chemical Engineering

What is plant design in chemical engineering? This module explores the various elements involved in designing a chemical processing plant. The training will cover aspects such as preliminary plant design, layout, integration of engineering principles, safety considerations, and economic evaluation.

Participants will learn about the latest tools and software used in chemical engineering plant design projects, enhancing their ability to plan, design, and analyze chemical processing systems efficiently. One of the critical challenges in chemical engineering is the design and economics of the plant. This section of the course addresses the economic considerations that are essential to plant design.

The course will also cover economic analysis and profitability assessment strategies that optimize the financial performance of a plant, ensuring that engineering solutions adhere to best practices and ethical standards in chemical engineering and plant design.

Course Content Breakdown

Unit 1: Chemical Processes

- Objectives of chemical processes.
- Principles of unit operations and unit processes, with examples.

Unit 2: Pipe Fittings

- Purpose of pipe fittings and fitting end preparations.
- Types of pipe fittings: elbows, reducers, weld tees, threadolets, laterals, and socket weld fittings.
- Pipe nipples and their uses.

Unit 3: Process Flow Diagrams

- Types of process flow diagrams (PFDs) and their symbols.
- Steam information tables and utilities such as heating and cooling.
- Equipment specifications.

Unit 4: Chemical Kinetics and Reactor Design

- Terminology related to chemical kinetics.
- Understanding the order of reaction and fractional conversion.
- Types of reactors and the design equations for each: batch reactors, mixed flow CSTR, and plug flow reactors (PFR).

Unit 5: Process Control and Instrumentation

- Basics of **Piping and Instrumentation Diagrams (P&ID)** and relevant terminologies.
- Common instrument abbreviations and P&ID legends.
- Overview of equipment classes, locally mounted instruments, symbols used, remote control, and the need for process control.

Unit 6: Plant Layout and Piping Design

- Basic concepts of plant layout and piping design.
- Design of processing facilities, including equipment and piping systems.

Unit 7: Design of Process Plant

- Key factors in the design of a process plant.
- Design tasks and required qualifications and skills.
- Common abbreviations used in plant design.

Unit 8: Procedures and Workflow Methods

- Physical quantities and units commonly used in design processes.
- Associated organizations and standards in chemical plant design.

Unit 9: Fluid

- Basic concepts of fluid dynamics and properties.
- Practical problems encountered in fluid handling and design.

Unit 10: Fluid Flows

- Fluid pressure and continuity equations.
- Understanding volume and velocity in fluid flow.
- Differentiating between laminar and turbulent flow.
- Using the Reynolds number, friction factors, and pressure drop calculations.

- Application of Bernoulli's equation.

Conclusion

Upon completion of this **Chemical Engineering and Plant Design Training** course, participants will receive a **Certificate in Chemical Engineering and Plant Design**, validating their enhanced skills and knowledge of plant design fundamentals. Participants will be well-equipped to apply these concepts in real-world applications, optimizing the design, operation, and economic performance of chemical plants.