## Course Overview

This **Chemical Engineering and Plant Design** course offers a deep dive into the multidisciplinary field of chemical engineering, combining principles from physics, chemistry, applied mathematics, and economics. The course focuses on the critical aspect of plant design, which includes creating safe and efficient chemical processing plants. Participants will learn how chemical engineers utilize their expertise to transform raw materials into valuable products, while also enhancing production methods, minimizing environmental impacts, and conserving resources.

## Targeted Groups

This course is designed for:

- **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:

- Understand the technical concepts involved in chemical plant engineering and the intricacies of plant layout.
- Develop insights into process and piping design, focusing on their application in chemical plant engineering.
- Enhance knowledge of core chemical engineering theories and concepts applicable within a working chemical engineering plant.

## Targeted Competencies

At the end of the training, participants will be able to:

- Understand **control valve manifolds** and their application in plant systems.
- Recognize common abbreviations in **chemical plant engineering**.
- Grasp **fluid properties** and their significance in preliminary plant design.
- Understand **volume and velocity** in fluid systems and their impact on plant design.
- Recognize **symbols** used in **chemical engineering plant design software**.

# Course Content

## Unit 1: Chemical Processes

In this unit, participants will explore the fundamentals of chemical processes:

- Objectives and principles.
- **Unit operations** and **unit processes**, including practical examples.

## Unit 2: Pipe Fittings

This unit focuses on essential pipe fittings in plant design:

- **Purpose** and types of pipe fittings.
- **Elbows**, **Reducers**, **Weld Tees**, **Threadolet**, and **Lateral** fittings.
- **Screwed** and **socket weld fittings**.
- Use of **pipe nipples**.

## Unit 3: Process Flow Diagrams

This unit covers the creation and interpretation of process flow diagrams:

- Types and **icons** used in diagrams.
- **Steam information tables** and **utilities** for heating and cooling.
- **Equipment specifications**.

## Unit 4: Chemical Kinetics and Reactor Design

Participants will learn about chemical reaction kinetics and reactor design:

- **Terminology** related to reaction kinetics.
- Understanding **reaction order**, **fractional conversion**, and **types of reactors**.
- Design equations for **batch reactors**, **mixed flow CSTR reactors**, and **plug flow reactors (PFR)**.

## Unit 5: Process Control and Instrumentation

This unit focuses on process control and instrumentation:

- Basics of **P&ID** (Piping and Instrumentation Diagram) and its interpretation.
- **Instrument abbreviations** and **P&ID legend sources**.
- Understanding **equipment classes**, **locally mounted instruments**, and **remote control**.
- Role of **control valve manifolds** in process control.
- The **need for process control** in chemical plants.

## Unit 6: Plant Layout and Piping Design

This unit covers the basics of plant layout and piping design:

- **Basic concepts** of plant design.
- The role of **processing facilities**, **equipment**, and **piping** in design.

### Unit 7: Design of Process Plant

Participants will learn about the factors and tasks involved in designing a chemical processing plant:

- Key factors to consider in plant design.
- Design tasks and required qualifications and skills.
- **Thumb rules** and common abbreviations used in plant design.

### Unit 8: Procedures and Workflow Methods

This unit introduces the standard procedures and methods used in plant design:

- **Physical quantities** and units commonly used in design.
- **Associated organizations** involved in plant design and engineering.

### Unit 9: Fluid

In this unit, participants will gain a strong understanding of fluid properties:

- **Basic fluid concepts** and properties.
- Practical problems and applications related to fluid behavior in plant systems.

### Unit 10: Fluid Flows

This unit explores fluid flow dynamics and its impact on chemical engineering:

- **Fluid pressure** and **continuity equations**.
- Relationship between **volume** and **velocity** in fluid systems.
- Study of **laminar** and **turbulent flows**, **Reynolds number**, **friction factors**, and **pressure drops**.
- **Bernoulli’s equation** and its application in fluid systems.

## Conclusion

Upon completing the course, participants will receive a **Certificate in Chemical Engineering and Plant Design**, recognizing their enhanced skills and comprehensive understanding of plant design fundamentals and practical applications. This certification will prepare participants to effectively contribute to the design, development, and management of chemical plants.