

# **MECHANICAL ENGINEERING ESSENTIALS**



**MUE101  
Mechanical &  
Utility  
Engineering**

**COURSE TITLE****MECHANICAL ENGINEERING ESSENTIALS****COURSE DATE/VENUE**

11<sup>th</sup>-15<sup>th</sup> mar 24'

Hyatt Regency London - The Churchill, London, UK

**COURSE REFERENCE**

MUE101

**COURSE DURATION**

05 Days

**DISCIPLINE**

Mechanical & Utility Engineering

**COURSE INTRODUCTION**

This course focuses on sound mechanical engineering principles, together with other engineering techniques including inspection, monitoring and condition evaluation, that enable mechanical engineers to design and maintain the equipment required by process engineers.

This essential combined course focuses on the central areas of Process and Mechanical Engineering and guides the delegates in developing both fundamental and practical understandings of key issues. Process engineering is at the heart of much of the chemical, oil, gas, and petrochemical industries.

Process and Mechanical engineers are interested in the safe containment, transportation and transformation of solids, liquids and gases. Of specific importance are separation processes including distillation, heat transfer, hydraulics and fluid flow, reaction engineering, process control and economics.

This course will provide a comprehensive review of the various aspects of engineered safety and mechanical integrity in refineries, oil & gas plants and petrochemical plants. Principal emphasis is placed on the primary means of achieving plant integrity, which is the prevention of pressure equipment and piping failures, particularly, any which could cause significant consequences.

**COURSE OBJECTIVE**

**By the end of this course, participants will be able to:**

- To assist participants in clearly understanding and applying the various aspects of engineered safety to ensure mechanical integrity in a responsible and cost-effective manner.
- To enhance the knowledge and skills of the participants in hazard identification and analysis; and in risk assessment and management.
- To provide participants with practical and effective methods and tools to perform practical likelihood and consequence analyses
- Apply practical understanding of central issues in process & mechanical engineering in oil, gas, petrochemical, chemical, and allied facilities
- Understand fundamental principles used in processes & facilities & apply practical understanding of essential process units & classes of units involved in separations, heat exchange & reactions.
- Apply practical understanding to static & rotating mechanical equipment & related condition mentoring & inspection techniques.
- Understand mechanical testing methods, Failure Mechanisms & Fitness for Service, NDT & principles of corrosion & corrosion protection.
- Perform relevant calculations & analyses to assist in operation, sizing, & troubleshooting of chemical processes & mechanical equipment.

**COURSE AUDIENCE**

This course is suitable to a wide range of professionals but will greatly benefit technical and non-technical personnel in the chemical, petrochemical, oil and process and mechanical industries with a need to understand and discuss fundamental process and mechanical engineering:

- Petroleum Engineers
- Mechanical Maintenance
- Production Engineers
- Process Engineers
- Economists & Business Managers

## **COURSE CONTENT**

### **Day One:**

#### **Module 1: Process Engineering Essentials: Upstream & Downstream Process Control & Optimisation**

##### **Introduction and Fundamentals of Process Engineering**

- Mass and energy balances
- Reactor types
- Process & Engineering Diagrams
- Flammability
- Electrical area classification
- Risk Management and Hazard Studies

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##### **Hydraulics and Fluid flow**

- Pressure and head & Bernoulli's theorem
- Flow of liquids, Reynolds number and pressure drop in pipes
- Two-phase and multi-phase flow
- Enthalpy and thermodynamics
- Principle of process relief devices and process design of relief systems
- Mechanical Equipment – Pumps, Compressors & Mixers

### **Day Two:**

#### **Heat Transfer and Reaction Engineering**

- Heat Transfer Mechanisms
- Heat transfer coefficients and calculation
- Heat exchangers, type and sizing
- Catalysis and Reaction Engineering
- Chemical reactions & kinetics
- Green Chemistry & Engineering and Sustainability

## **Distillation Processes and Equipment**

- Phase behavior and vapour/liquid equilibria
- Gas/Liquid separation
- Distillation equipment - Columns and vessels
- Troubleshooting of process equipment
- Overview of Other Separation Processes
- Effluent treatment [in refinery and petrochemical] industries

## **Day Three:**

### **Process Control and Economics**

- Classification of control systems
- Measured variables
- Simple feedback control
- Preliminary economic analysis
- Fixed and variable costs, break even analysis
- Estimating the cost of process equipment and plants

## **Module 2: Mechanical Engineering Essentials: Rotating & Static Equipment & Structural Integrity**

### **Introduction & Fundamentals of Materials Selection, Types & Failures**

- Engineering Material Properties and Selection
- Materials Testing
- Types of Metals
- Static Strength and Fitness For Service
- Materials Failure Mechanisms
- Mechanical Design, Standards and Codes

## **Day Four:**

### **Static Equipment, Valves, Piping & Fitness for Service**

- Valves Types and Characteristics
- Valve Selection

- Relief Valve and Flare Systems
- Piping Systems and Pipe Supports
- Overview of API 570 - Inspection & repair of Pipelines & Piping
- Process Utilities
- Distillation equipment
- Cooling Water Systems and Treatment
- Vessels and tanks
- Drain system and Flare
- Fitness for Service, API 579 overview

### **Rotating Equipment, Pumps & Compressors**

- Pump Types, Positive Displacement and Dynamic
- Pump curves
- Pump Selection
- Types of Compressors
- Compressor Performance Curves

### **Day Five:**

### **Corrosion & Corrosion Protection**

- Corrosion Fundamentals
- Types of Corrosion
- Corrosion Inspection and Monitoring
- Corrosion Minimization
- Corrosion Protection

### **Mechanical Maintenance**

- Strategies & Philosophies
- Code and Standards
- Condition Monitoring
- Non Destructive Inspection techniques

## **COURSE CERTIFICATE**

**TRAINIT ACADEMY** will award an internationally recognized certificate(s) for each delegate on completion of training.

## **COURSE FEES**

£5,500 per Delegate. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

## **COURSE METHODOLOGY**

The training course will be highly participatory and the course leader will present, guide and facilitate learning, using a range of methods including formal presentation, discussions, sector-specific case studies and exercises. Above all, the course leader will make extensive use of real-life case examples in which he has been personally involved. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Case studies & Practical Exercises
- 10% Role Play
- 10% Videos, Software or Simulators (as applicable) & General Discussions

## **COURSE VENUE IMAGES**

**Hyatt Regency London - The Churchill, London, UK**



