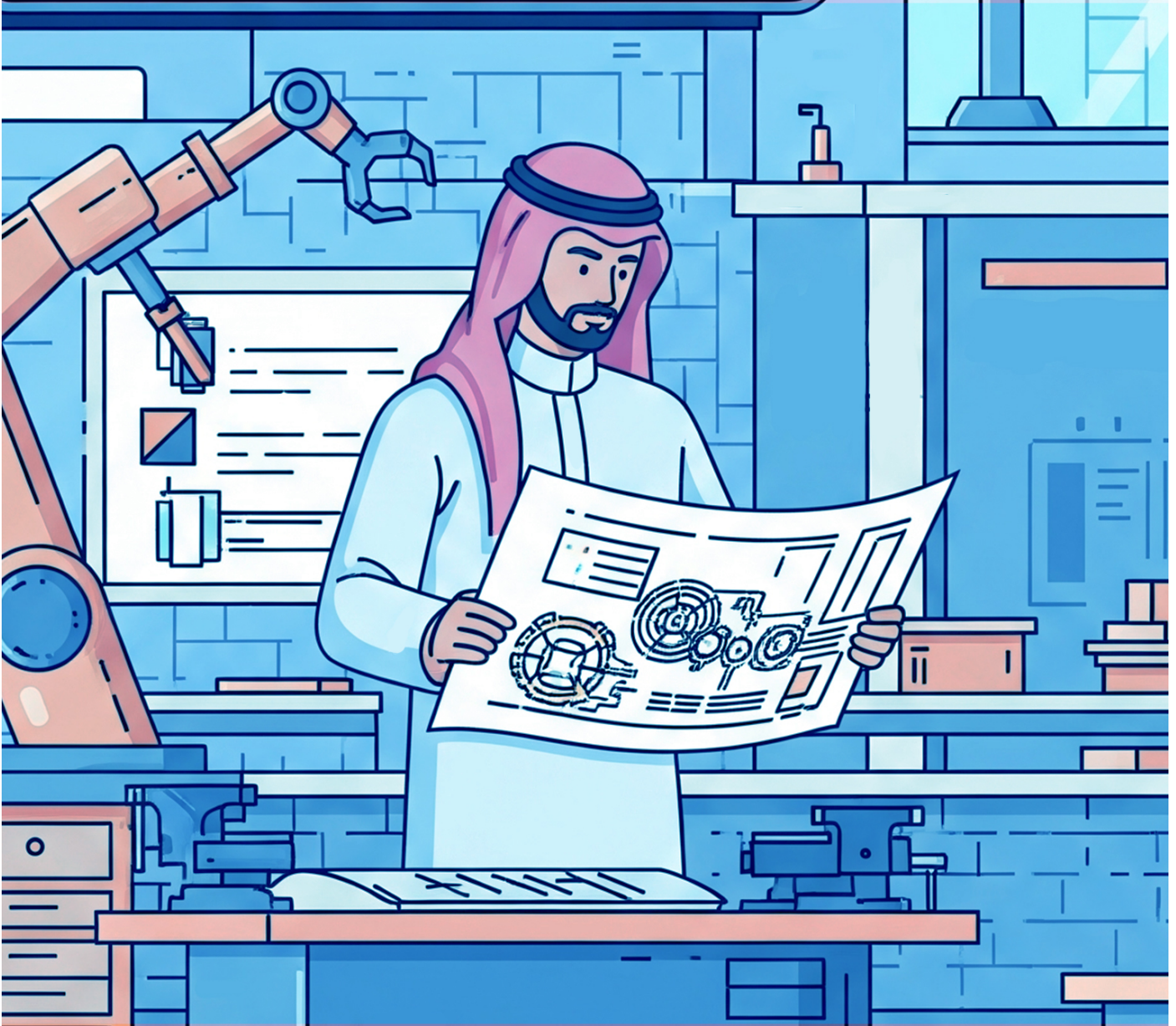




Mechanical Engineering

## **Pumps Operation, Maintenance and Trouble Shooting**

## Course Introduction

---

This course aims to convey the latest thinking and best practice of Rotating Equipment Machinery Components especially Pumps which we consider it the important types of Rotating Equipment's, also will explain to the participants about conditions monitoring and analysis via lectures, case studies, video films and course activities.

The course gives a detailed advanced treatment of the detection, location and diagnosis of faults and failures in Pumps. Case study and examples are used throughout the course to emphasize key points and to underline the relevance and applicability of the topics being addressed.

The course will provide a refreshment of knowledge for the how both of them concepts and how it work and what are main problems facing it during operations of them. Also, it will provide a solid foundation for technologists moving into a machine monitoring and diagnostic role.

## Target Audience

---

- Automotive Engineer
- Boiler Engineer
- Ceramics Engineer
- Equipment Engineer
- High-Pressure Engineer
- Marine Engineer
- Mechanical Design Engineer
- Mechanical Engineer
- Naval Architect
- Pipeline Engineer
- Power Engineer
- Rotating Equipment Engineer
- Senior Mechanical Engineer
- Turbine Engineer

- Validation Engineer

## Learning Objectives

---

- To familiarize participant to the different types of Pumps and the range of their applications.
- To deepen the participants understanding of the limits of Pumps operation.
- Learn the Critical Symptoms of Pump Operation
- Enhance the knowledge on Pump Sealing and Rolling Elements
- Gain additional knowledge on Inspection and Maintenance of Centrifugal Pumps
- Read and interpret the performance curves of Pumps and provide overview of testing standards/codes.
- To Understand Operation, maintenance & Troubleshooting aspects including the Start-up, priming, shut down.
- To know Preventive and Predictive maintenance of Pumps
- To understand principles of Condition Based Monitoring.

## Course Outline

---

- **01 DAY ONE**

### **Module (01) Pump Theory**

- 1.1 Pumping Process Concept
- 1.2 Physical properties of Incompressible Fluid
- 1.3 Operating Parameters (Head, Flow, rpm, Power, and Efficiency)
- 1.4 Pump Arrangement; Series and Parallel
- 1.5 Pump Types and Terminology

### **Module (02) Centrifugal Pump**

- 2.1 The Principle of Energy transfer in Centrifugal Pump
- 2.2 Pump Applications 2.3 Centrifugal Pump Construction
- 2.4 Classification of Centrifugal Pumps
- 2.5 Types of Impellers
- 2.6 Types of Casings
- 2.7 Prime Mover of Pump
- 2.8 Mechanical Features
- 2.9 Pump Operation Procedures
- 2.10 Pump Troubleshooting

• **02 DAY TWO**

**Module (03) Positive Displacement Pumps (Linear Motion)**

- 3.1 Classification
- 3.2 Reciprocating Pump
- 3.3 Type and Discharge of Reciprocating Pumps
- 3.4 Diaphragm Pump
- 3.5 Principle of Operation
- 3.6 Pump Troubleshooting

**Module (04) Positive Displacement Pumps (Rotational Motion)**

- 4.1 Screw Pump
- 4.2 Lobar Pump
- 4.3 Gear and Vane Pump
- 4.4 Principle of Operation
- 4.5 Pump Troubleshooting

• **03 DAY THREE**

**Module (05) Cavitation Phenomena**

- 5.1 Concept of Cavitation 5.2 Symptoms of Cavitation
- 5.3 Effects of Cavitation
- 5.4 How to avoid Cavitation

## **Module (06) Pump Auxiliary System**

- 6.1 Bearings – failure modes and how to extend life
- 6.2 Lubrication – different methods of lubrication
- 6.3 Coupling and Alignment
- 6.4 Mechanical Seals – maintenance and repair it
- 6.5 Gland Packing - types and how to change it
- 6.6 Pump vibration monitors – how to avoid vibration
- 6.7 Warm up system – why and how it works

### **• 04 DAY FOUR**

## **Module (07) Cavitation Phenomena**

- 7.1 Concept of Pump Cavitation
- 7.2 General Symptoms of Cavitation
- 7.3 Cavitation effects on Pump and its parts
- 7.4 How to avoid cavitation

## **Module (08) Pump Maintenance**

- 8.1 Planned Maintenance Activities
- 8.2 Predictive and Preventive
- 8.3 Reliability Programs

### **• 05 DAY FIVE**

## **Module (09) Pump Troubleshooting**

- 9.1 Centrifugal Pumps Troubleshooting
- 9.2 Reciprocating Pumps Troubleshooting
- 9.3 Rotary Pumps Troubleshooting
- 9.4 Auxiliary System Troubleshooting
  - 9.4.1 Power System
  - 9.4.2 Lube Oil System

- 9.4.3 Sealing System
- 9.4.4 Warm up and Cooling System

## Module (10) Machine Failure (Pump Applications)

- 10.1 Why Machine Failure?
- 10.2 Types of Failure Causes
- 10.3 Effect of Failure on the Plant
- 10.4 Failure Cascading
- 10.5 Failure Modes
- 10.6 Chronic vs. Sporadic Failure
- 10.7 Water hammer
- 10.8 Over pressure
- 10.9 Inspection and Maintenance of Pump

## Confirmed Sessions

| FROM          | TO           | DURATION | FEES       | LOCATION        |
|---------------|--------------|----------|------------|-----------------|
| May 11, 2025  | May 15, 2025 | 5 days   | 4250.00 \$ | KSA - Al Khobar |
| July 28, 2025 | Aug. 1, 2025 | 5 days   | 4250.00 \$ | UAE - Dubai     |
| Nov. 3, 2025  | Nov. 7, 2025 | 5 days   | 4250.00 \$ | UAE - Abu Dhabi |
| Nov. 2, 2025  | Nov. 6, 2025 | 5 days   | 4250.00 \$ | Oman - Muscat   |