



Mechanical Engineering

Mechanical Parameters Reading and Measuring

Course Introduction

This training course is designed to provide participants with the fundamental concepts of reading and measuring mechanical parameters. This course will help participants become knowledgeable of the terms and conditions surrounding mechanical measurement and how they can improve their performance that involves these tasks. This course covers topics such as the principles of engineering metrology, measurement concepts, measuring instruments, standards of measurement, basic definitions, elements of measurements and many more.

Target Audience

1. Machine Diagnostics & Maintenance – Measuring vibration, temperature, pressure, and load.
2. Quality Control & Inspection – Ensuring mechanical components meet specifications.
3. Reliability & Performance Engineering – Analyzing data for predictive maintenance.

Learning Objectives

- Gain a comprehensive understanding of the basic principles of engineering metrology and mechanical parameters for reading and measurement.
- Explore the standards of measurement for reading.
- Familiarize oneself with the key terms and definitions of mechanical measurement system.
- Identify the functional elements of measurement systems
- Obtain the ability to read and measure force, torque, and strain, temperature, and pressure.

Course Outline

• 01 DAY ONE

Basic Principles of Engineering Metrology

- Introduction
- Metrology
- Need for Inspection
- Accuracy and Precision
- Accuracy and Cost
- Objectives of Metrology and Measurements
- General Measurement Concepts
- Calibration of Measuring Instruments
- Errors in Measurements
- Systematic or Controllable Errors
- Random Errors
- Methods of Measurement

Standards of Measurement for Reading

- Standards and their Roles
- Evolution of Standards
- Material Standard
 - Yard
 - Metre
- Disadvantages of Material Standards
- Wavelength Standard
- Modern Metre
- Subdivisions of Standards
- Line and End Measurements
 - Characteristics of Line Standards
 - Characteristics of End Standards
- Transfer from Line Standard to End Standard

- Brookes Level Comparator
- Displacement Method
- Calibration of End Bars
- Numerical Examples

• 02 DAY TWO

Mechanical Measurements

- Introduction
- Some Basic Definitions
 - Hysteresis in Measurement Systems
 - Linearity in Measurement Systems
 - Resolution of Measuring Instruments
 - Threshold
 - Drift
 - Zero Stability
 - Loading Effects
 - System Response
- Functional Elements of Measurement Systems
- Primary Detector-Transducer Stage
- Intermediate Modifying Stage
- Output or Terminating Stage

Transducers

- Introduction
- Transfer Efficiency
- Classification of Transducers
 - Primary and Secondary Transducers
 - Based on Principle of Transduction
 - Active and Passive Transducers
 - Analog and Digital Transducers
 - Direct and Inverse Transducers
 - Null- and Deflection-type Transducers
- Quality Attributes for Transducers
- Intermediate Modifying Devices
 - Inherent Problems in Mechanical Systems
 - Kinematic Linearity

- Mechanical Amplification
- Reflected Frictional Amplification
- Reflected Inertial Amplification
- Amplification of Backlash and Elastic Deformation
- Tolerance Problems
- Temperature Problems
- Advantages of Electrical Intermediate Modifying Devices
- Electrical Intermediate Modifying Devices
 - Input Circuitry
 - Simple Current-sensitive Circuits
 - Ballast Circuit
 - Electronic Amplifiers
 - Telemetry
- Terminating Devices
 - Meter Indicators
 - Mechanical Counters
 - Cathode Ray Oscilloscope
 - Oscillographs
 - XY Plotters

• 03 DAY THREE

Reading and Measuring Force, Torque, and Strain

- Introduction
- Measurement of Force
 - Direct Methods
- Elastic Members
 - Load Cells
 - Cantilever Beams
 - Proving Rings
 - Differential Transformers
- Measurement of Torque
 - Torsion-bar Dynamometer
 - Servo-controlled Dynamometer
 - Absorption Dynamometer
- Measurement of Strain
 - Mechanical Strain Gauges
 - Electrical Strain Gauges
- Strain Gauge Materials
- Backing or Carrier Materials
- Adhesives

- Protective Coatings
- Bonding of Gauges
- Gauge Factor
- Theory of Strain Gauges
- Methods of Strain Measurement
- Strain Gauge Bridge Arrangement
- Temperature Compensation in Strain Gauges
 - Adjacent-arm Compensating Gauge
 - Self-temperature Compensation

Reading and Measuring Temperature

- Introduction
- Methods of Measuring Temperature
- Thermocouples
 - Laws of Thermocouples
 - Thermocouple Materials
 - Advantages and Disadvantages of Thermocouple Materials
 - Thermopiles
- Resistance Temperature Detectors
- Thermistors
- Liquid-in-glass Thermometers
- Pressure Thermometers
- Bimetallic Strip Thermometers
- Pyrometry
 - Total Radiation Pyrometer
 - Optical Pyrometer
 - Fibre-optic Pyrometers
 - Infrared Thermometers

• 04 DAY FOUR

Reading and Measuring Pressure

- Introduction
- Pressure Measurement Scales
- Methods of Pressure Measurement
 - Static Pressure Measurement
 - Classification of Pressure Measuring Devices

- Manometers for Pressure Measurement
- Ring Balance
- Inverted Bell Manometer
- Elastic Transducers
- Electrical Pressure Transducers
 - Resistance-type Transducer
 - Potentiometer Devices
 - Inductive-type Transducer
 - Capacitive-type Transducer
 - Piezoelectric-type Transducer
- Varying Pressure Measurement
- Dead-weight Pressure Gauge
- Measurement of Vacuum
 - McLeod Gauge
 - Pirani Gauge
 - Ionization Gauge
 - Knudsen Gauge
- High-pressure Measurement

Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
July 14, 2025	July 17, 2025	4 days	4250.00 \$	UAE - Dubai
Sept. 8, 2025	Sept. 11, 2025	4 days	4250.00 \$	UAE - Abu Dhabi
Dec. 1, 2025	Dec. 4, 2025	4 days	4250.00 \$	UAE - Dubai