

# FORCE METROLOGY

## Course overview

The course will help anyone wishing to measure force in any industrial or laboratory environment. It is essentially a guide for the user of the measurement and should help them to understand the range of measurement techniques available, how to characterize the requirements of their particular problem, and how to communicate those needs to manufacturers and suppliers of force measurement equipment. It also aims to give an understanding of the needs for, and methods of, calibrating, operating and maintaining force measurement systems. The range of forces covered is approximately  $10^{-3}$  to  $10^9$  newtons, and they may be static or dynamic, single or multi-axis.

## Pre-Requisites for attending this course

- Measurement System (Part 1 & 2)
- Uncertainty of Measurement – Physical Measurements

## Course content

Introduction

Force and other physical quantities : Mass, force, weight, load, terminology

Force measurement

Force measurement systems

Characteristics of force measurement systems

Introduction to methods of force measurement

Strain gauge load cells

Piezo-electric Quartz force transducers

Measuring force through pressure

Other types of force measuring equipment

Applications

Range of applications

During development of a product

During manufacture

Systems that measure of control force for safe operation

Process weighing

Choice, design and operation of systems

Choice of force measurement system

Design considerations

Operating the force measurement system

General Do's and Don'ts

Materials testing

Hardness testing

Tensile testing

Impact testing

Torque testing

Calibration

Methods

Calibration certificates

Analysis of the calibration data

Measurement error and uncertainty

## Who should attend

Metrologists and quality practitioners wishing to learn the fundamentals of force measuring principles, and how to perform calibrations of various instruments and devices. Attendees of this course should preferably have previous experience of metrology work and inspection procedures.

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## **Course Duration**

5 Days

## **Evaluation**

Daily tests and the passing of a final examination are required in order to successfully complete this course.