

# 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

- Introduction to Measurement
- Method Validation (Calibration)
- Uncertainty of Measurement – GUM (Physical)

## 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.

## Course Duration

5 Days

## Evaluation

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

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