



# IIGDT Training

## “Measurement Uncertainty”

### Objective:

Provide a foundational understanding of measurement uncertainty per the ASME B89.7.2 Standard on “Guidelines for the Evaluation of Dimensional Measurement Uncertainty.” To solidify fundamental to intermediate information in interpretation, application and analysis of measurement uncertainty using multiple measurement instruments and sensors to determine compliance to mechanical drawing requirements; To understand the strengths and weaknesses of the GR&R approach and a total assessment of measurement uncertainty;

### Course Length:

2 days (16-hours) – 1.6 CEU’s

### Course Content:

**Understand conventional Gage Repeatability and Reproducibility studies and describe the strengths and weaknesses of the GRR approach and a total assessment of measurement uncertainty**

- Complete a process demonstrating a full analysis of measurement capability including the role of a GR&R within that analysis
- Evaluate implications on measuring for proof of compliance -vs- measuring for development or process understanding -vs- process monitoring

**Understand the role of ASME B89.7.3.2 in the development of a measurement uncertainty management**

- Understand the definition of the “measurand” and the associated “validity conditions”
- Understand decision rules for accepting and rejecting inspected parts
- Understand process capability measures and their interaction with gage capability measures
- Understand rules and procedures for tolerance to uncertainty ratios

**Understand sources of uncertainty common to frequently used measurement devices: precision hand tools (1D), video sensors (2D), touch trigger probes and scanning probes (3D)**

- Develop a measurement uncertainty budget including the interaction of environmental, part, set-up, point density, fitting algorithm, operator effects, etc.

**Understand the process for continual improvement in reducing measurement uncertainty sources to acceptable levels and maintaining those levels**

### Targeted Audience:

Anyone with the responsibility of establishing measurement procedures and analyzing the implications of various measurement methods and techniques for achieving precision measurements. Inspection planners, specifiers and decision makers of engineering and measurement requirements, specifiers of manufacturing processes and measurement applications and anyone doing statistical analysis of design, manufacturing or measurement data. Engineers, designers, metrologists, technicians, machinists, toolmakers, senior inspectors, senior technicians, statisticians and mechanical engineers at all levels.

### Prerequisites:

**GD&T Advanced Applications and Applied Dimensional Metrology! All individuals must have an advanced working knowledge of GD&T and a foundational knowledge of Applied Dimensional Metrology to be successful in this class.**