

Integrated GD&T (4-day course)

Overview:

This unique GD&T course integrates and combines the learning of GD&T with measurement and inspection techniques. The course gives the participant a practical and easy understanding of GD&T as it applies to the ANSI/ASME Y14.5M-1994 standard including changes made in the 2009 standard, along with exposure to inspection methods that are commonly available in manufacturing and quality. The course covers both the basic and mid-level GD&T concepts in easy to understand explanations and uses print reading exercises containing GD&T callouts throughout the program. Exposure to measuring fundamentals as it applies to GD&T will be demonstrated through the use of standard measuring tools and inspection equipment. This course is ideal for anybody who measures any GD&T callouts including engineers, quality technicians, and manufacturing machinists. Many interpretations of both GD&T callouts and inspection methods are made. Some may be correct; many are not. This course highlights what is right and wrong and clarifies some common mistakes.

Textbooks:

Two great texts are provided along with handouts.

“Geometric Dimensioning and Tolerancing” by David Madsen (a \$53 value) and “Geometric Dimensioning and Tolerancing: Application and Inspection” by Gary Griffith (a \$106 value)

- I. Dimensioning and Tolerancing rules and practices
 - a. MMC, Maximum Material Conditions
 - b. LMC, Least Material Conditions
 - c. Conditions of Free State Versus Restrained
 - d. Extreme Form Variation
- II. Symbols and Terms
 - a. Simplifying the Feature Control Frame
 - b. Basic Dimensions
 - c. Geometric Characteristic Symbols
 - e. 1982 ANSI Symbols Versus 1994 ASME including 2009 upgrades
 - e. Bonus Tolerance
- III. Size Tolerances
 - a. Boundary of Size
 - b. Measuring or Hard Gaging?
 - c. Using the Datum Reference Frame
- IV. Datums
 - a. Datum Targets
 - b. Establishing setups for Datums
- V. Form and Profile Tolerances
 - a. Straightness, Flatness
 - b. Options of Checking Flatness
 - c. Straightness of a Surface Versus Axis
 - d. Circularity and Cylindricity
 - e. Profile of a Line and Profile of a Surface
- VI. Orientation
 - a. Parallelism and its Confusion with Flatness

- b. Perpendicularity
 - c. Angularity and measuring with a Sine Bar
- VII. Runout
 - a. Circular Runout with an Indicator and Vee Block
 - b. Total Runout, the Difference from Runout Inspection
- VIII. Location Tolerances
 - a. Position, Making It Easy To Understand
 - b. Position with a Bonus Tolerance
 - c. Gaging at MMC
 - d. Concentricity and Symmetry Often Inspected Incorrectly
 - e. Virtual Condition

Prerequisite:

A basic understanding of reading prints is recommended for all participants prior to attending this class. In addition, students should have some knowledge of basic measuring instruments. For students without much experience with measuring instruments, it is recommend that they first attend a course on dimensional measurement and metrology, such as Mitutoyo course #102, Dimensional Metrology, prior to attending this course.

Instructor:

David King has over 40 years experience in industry. His background includes completion of a 4-year tool & die apprenticeship, honors graduate of Mohegan College, and is a certified ASQC Mechanical Inspector. As an adjunct instructor in the Connecticut Community Technical College System, he has developed many courses including Print Interpretation, Basic Metrology, Layout Inspection, Operator Certification Programs, and Understanding Metrics. As a project engineer in industry, he has developed numerous manufacturing techniques and processes.

CURRICULUM:

Dimensional Metrology is a 2-day class, followed by Gage Calibration Systems & Methods, also a 2-day class. These 4 days are held consecutively in the same week at each location.

INTEGRATED GD&T is a 4-day class that follows the week of Dimensional Metrology and Gage Calibration Systems & Methods at each location, within a week or two.

Hands-On Gage Calibration is a 3-day class held every other month at our world-class Calibration Laboratory in Elk Grove Village, IL.

Measurement Uncertainty is a 2-day class in which we hold once a year at most Mitutoyo locations.

On Demand courses in CMM, MSA, Gage R&R, Surface Finish and Form Measurement can be provided.

Mitutoyo and its Institute of Metrology is a worldwide organization. We are proud to state that more than 200,000 engineers have attended our metrology seminars over the years. If you wish to register or if you have additional questions, please contact us at 630-723-3620, 888-MITUTOYO, or email mim@mitutoyo.com