

## Hands-On Gage Calibration (3-day course)

### Overview:

The “Hands-On” Gage Calibration course is a unique educational opportunity designed specifically for those who need to perform calibrations of dimensional measuring tools, gages, and instruments. The course is taught at the world-class, Mitutoyo America A2LA accredited calibration laboratory, and the instructors include experienced technicians, engineers, and managers. The class size is intentionally small – a maximum of 6 students – to ensure personalized and customized instruction. In addition, the class can be broken into smaller groups to specifically address the desires and needs of the individual student.

The Hands-On Gage Calibration course is taught over 3-days, but the first day is optional for students who have attended courses on Gage Calibration Systems (like Mitutoyo courses #110 or #210) or who have strong knowledge or experience in general concepts of quality and calibration systems. The second and third days of the course jump quickly into practical “how-to” calibration procedures, and we want to make sure that all students have the necessary background in the general role of calibration and why certain practices are followed. With the small size class, it is important that all students have the necessary background training to ensure they get the full benefits on the practical hands-on experience.

### Course Details:

Day-1 provides an overview of the essential elements and operation of a modern Gage Calibration System. Topics include modern quality system standards, calibration and traceability, laboratory accreditation, temperature issues and control for calibration, estimates of uncertainty, and assessing laboratory performance.

Day-2 and Day-3 focus on the application of calibration procedures in the laboratory environment. Students will have the opportunity to complete actual calibrations to develop their skills. Due to the small class size, students will have some freedom to determine their own pace for covering the material. The course will begin with some common dimensional calibrations, but allow individual students to cover topics of interest. Therefore, the exact course content depends on the students attending. Not all of the potential procedures will be covered within the second and third days. At the time of enrollment, students will complete a questionnaire to ensure the customized course meet their needs. Students will receive detailed handout materials with sample calibration procedures, photos, and example worksheets.

Some of the possible calibrations and methods that could be taught in this class are shown below. Calibration methods for other types of measuring instruments and gages are also possible as facilities allow. Please discuss any special requests at the time of registration.

	<b>Item to be Calibrated</b>	<b>Calibration Method</b>
Included	Micrometers – outside	Comparison to master gage blocks
Included	Calipers – vernier, dial, digital	Comparison to gage blocks and caliper checker
Included	Dial indicators	Indicator tester
Included	Digital indicators	Comparison to master gage blocks

Included	Height gages	Comparison to master gage blocks
Included	Length standards/micrometer standards	Mechanical comparison to master gage blocks
Optional	Gage blocks	Mechanical comparison to master gage blocks
Optional	Step gages	Mechanical comparison to master gage blocks
Optional	Height masters	Mechanical comparison to master gage blocks
Optional	Plain cylindrical ring gages	1-D comparator using master rings gages
Optional	Plain cylindrical plugs	1-D comparator using master gage blocks
Optional	Spheres	1-D comparator using master gage blocks
Optional	Pin gages	1-D comparator using master gage blocks
Optional	Pin gages	Laser scanning micrometer
Optional	Thread measuring wires	1-D comparator using master gage blocks
Optional	Radius gages	Optical comparator
Optional	Angle gages	Optical comparator
Optional	Thickness gages	1-D comparator using master gage blocks
Optional	Sine bars	1-D comparator using master gage blocks
Optional	Line scales	Vision CMM
Optional	Squares	Comparison to master square
Optional	Roundness of spheres/hemispheres/rings	Roundness machine
Optional	High accuracy roundness	Roundness machine and reversal method
Optional	Flatness of optical flats	Optical comparison to optical flat
Optional	Straightness of precision straightedges	Form measuring instrument
Optional	High accuracy straightness	Form measuring instrument and reversal method
Optional	Cylindrical squares	Form measuring instrument and reversal method
Optional	Surface finish specimens	Surface finish instrument
Optional	Micrometers – inside	Comparison to master gage blocks
Optional	Micrometers – depth	Comparison to master gage blocks
Optional	Micrometer heads	1-D comparator using master gage blocks
Optional	Test indicators	Indicator tester
Optional	Linear gages	Comparison to master gage blocks
Optional	Height gages	Comparison to master gage blocks
Optional	Bore gages	Comparison to ring gages
Optional	Precision levels	Sine bar and gage blocks
Optional	Squares	High accuracy CMM and reversal method
Optional	Length standards	High accuracy CMM
Optional	Plain cylindrical ring gages	High accuracy CMM
Optional	Plain cylindrical plugs	High accuracy CMM
Optional	Spheres	High accuracy CMM

**Fee Schedule:**

Advance pricing is available when registration is completed more than two weeks prior to the start of the class.

3-day Hands-On Gage Calibration:      Advance pricing - \$1,861 per student  
Standard pricing - \$2,044 per student

