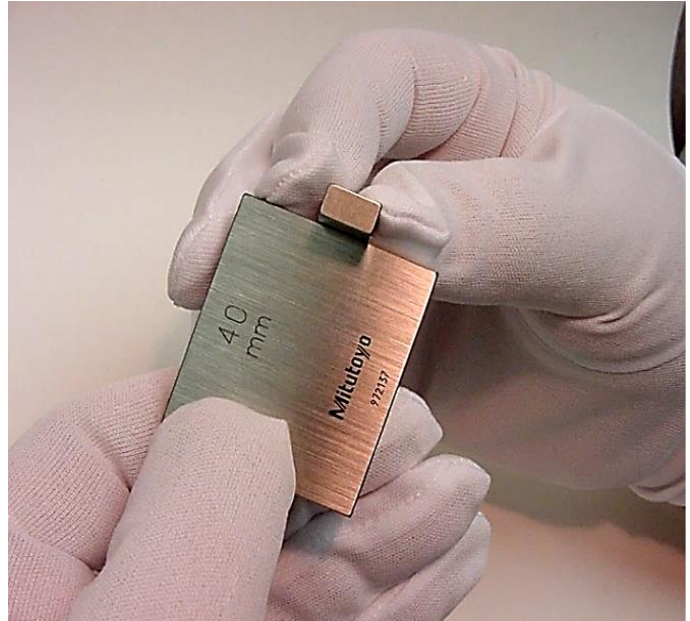


Dimensional Metrology Educational Curriculum

Dimensional metrology – the science and practice of dimensional measurement – is one of the fundamental educational series of the Mitutoyo Institute of Metrology. The full curriculum consists of free online educational material and videos plus a series of independent classroom courses that cover all aspects of dimensional measurement and inspection, from calipers to gage blocks to coordinate measuring machines. Students can choose which courses are most relevant and create their own unique educational experience. Our modern dimensional metrology curriculum is for anyone wanting to learn about dimensional measuring equipment and strategies for implementation, including selection, application, calibration, and care of dimensional measuring systems. Principles and practice are taught with a hands-on experiential learning approach to engage the students and promote retention of the concepts.



Four independent classroom courses are currently available in our Dimensional Metrology series:

- **Seminar 101: Dimensional Measurement with Precision Measuring Equipment**
- **Seminar 111: Introduction to Dimensional Gage Calibration**
- **Seminar 215: Dimensional Measurement with CMMs, Vision, and Form Instruments**
- **Seminar 216: Dimensional Metrology Quality**

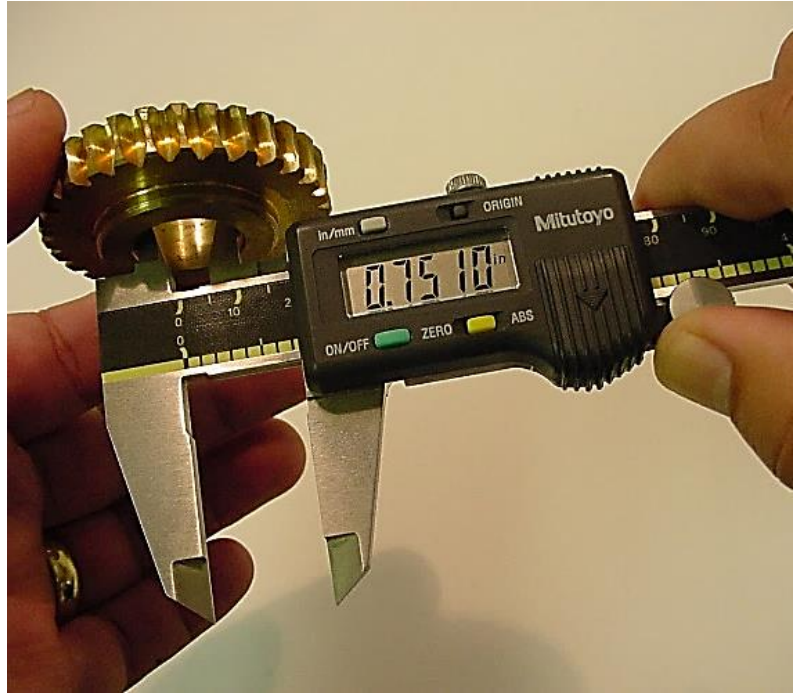
Many students may wish to take all four courses in sequence and therefore we try to provide a schedule that makes that possible. Seminars 101 and 111 are frequently offered together in a 3-day sequence. Similarly, seminars 215 'Dimensional Measurement with CMMs, Vision and Form Instruments' and 216 'Dimensional Metrology for the Quality Professional' are frequently offered together.

Students looking for a more in-depth dimensional calibration course are encouraged to explore our 3-day [Seminar #114 Dimensional Gage Calibration](#) which is only available at the Metrology Training Lab at the headquarters of Mitutoyo America in Aurora, Illinois.



Seminar 101: Dimensional Measurement with Precision Measuring Equipment

This 2-day classroom course is designed for individuals new to the manufacturing environment who need to use and care for basic precision measuring equipment. This course is also excellent for those needing a refresher in dimensional measurement or those looking to expand their skills with more diverse or precise measuring equipment. This course covers an introduction to industrial measurement and instruments such as gage blocks, steel rules, calipers, micrometers, depth micrometers, dial indicators, and height gages. This course covers equipment principles, measuring techniques, and best practices for the use of dimensional measuring equipment. Participants will have extensive hands on use of the gages and instruments measuring actual parts. The specific measuring instruments covered, including the use of metric instruments, is flexible to address the needs of the individual students.



Prerequisites: Students are encouraged to start with the free online resources to establish base knowledge to ensure a successful classroom experience. The Education On-Demand resources at www.mitutoyo.com/on-demand include a section on *Fundamental Education Resources*, which should be studied prior to attending class.



Seminar 111: Introduction to Dimensional Gage Calibration

This 1-day classroom course is a blended learning opportunity to maximize the student's time in the classroom. Adapted from our popular 3-day Dimensional Gage Calibration course, this 1-day version utilizes Mitutoyo America's online video material, which is to be watched prior to attending the classroom course. By watching the videos in advance, the time together in the classroom can focus on hands on learning.

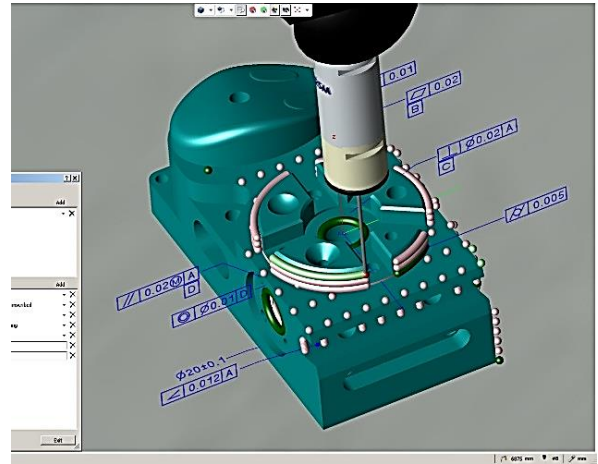
The course will thoroughly cover micrometer and caliper calibration, as well as touch on all types of indicators, and in addition, the course will build a base understanding of the principles in dimensional calibration such that the student can extend the concepts to other measuring equipment. This course also includes the opportunity for all students to complete the [Level 1 and Level 2](#) tests necessary to earn Mitutoyo Certified Credentials in Dimensional Gage Calibration for micrometers and calipers. This testing is included at no extra charge and is particularly useful at demonstrating knowledge and skills to managers and auditors. For those from accredited calibration labs, this testing is also a recognized Proficiency Test.

Prerequisites: To be successful in this course, students should have prior experience using micrometers, calipers, and indicators (successful completion of Seminar 101 satisfies this prerequisite). Students are also required to watch approximately two hours of free instructional videos prior to attending this seminar. Students who do not meet these prerequisites may struggle with this course.



Seminar 215: Dimensional Measurement with CMMs, Vision, and Form Instruments

This 2-day classroom course is designed for anyone using advanced dimensional measuring systems, such as coordinate measuring machines (CMMs), vision systems, roundness testers, and surface finish measuring instruments. This course is not a Mitutoyo software training course, but is designed to complement the product training offered by Mitutoyo or anyone else. The goal of this course is for the student to develop deeper knowledge of how these advanced measuring systems operate, including hardware and software, to enable the student to maximize the potential of their measuring equipment. The course will focus on best measurement practices for the complicated dimensions and tolerances typically measured on these systems, include geometric dimensioning and tolerancing (GD&T) from ASME Y14.5 and ISO 1101. This course will cover topics such as CMM proper use of datums and how to build coordinate systems, p accuracy, filtering and cutoffs, and other critical topics that r kind of measuring equipment. This course will focus heavily therefore familiarity with GD&T is necessary for a successful GD&T from a measurement perspective and will provide opp knowledge. This course combines theory with practice and i course is taught in the Metrology Training Lab at Mitutoyo An that will be used by the students.



Prerequisites: To be successful in this course, students must have prior experience on some type of CMM and must have basic understanding of GD&T. Prior experience with vision or form equipment is useful, but optional. Students with no prior CMM experience, or who have not attended the CMM software training provided by their CMM manufacturer, should not attend this course.

Seminar 216: Dimensional Metrology Quality

This 1-day course focuses on measurement quality – including how to understand and assess the errors in dimensional measuring systems. The primary topic of this course is Gage Repeatability and Reproducibility (Gage R&R), a common tool to study variation in measuring systems. This course will then go beyond Gage R&R and study common measurement errors that are typically not well addressed in Gage R&R studies, including the impact of temperature and the selection of measurement methods. This course will also introduce the concept of Measurement Uncertainty, which formally represents all the likely measurement errors into a single estimated value. The use of uncertainty versus Gage R&R will be discussed. Lastly, this course will introduce the importance of calibration in managing measurement quality, including the selection of proper in-house methods, how to select external calibration services, and the role of ISO/IEC 17025 accreditation of calibration services. This course combines theory with practice and is taught in a hands on, experiential, manner.

Prerequisites: To be successful in this course, students should have prior experience using dimensional measuring equipment. This course does involve some math, and students should be comfortable with basic algebraic and statistical calculations.



Course Pricing and Registration Information

Mitutoyo education courses are available throughout the year at various locations. Please visit our website at www.mitutoyo.com/education for the current availability. Our website also lists additional courses, including our popular 3-day Gage Calibration course, as well as the free On-Demand Educational Resources and the Online Training and Certification.



Registration:

For questions or registration, please contact the Mitutoyo America Education Department at 888-MITUTOYO (option 6) or direct at 630-723-3620. Office hours are 8:30 am to 5:00 pm Central Time. We can also be reached via email at mim@mitutoyo.com. Purchase orders can be faxed to 630-978-6471.

Pricing:

Course	No. of Days	Advanced Price	Standard Price
Seminar 101: Dimensional Measurement with Precision Measuring Equipment	2	\$ 890	\$ 995
Seminar 111: Introduction to Dimensional Gage Calibration	1	\$ 890	\$ 995
Seminar 215: Dimensional Measurement with CMMs, Vision, and Form Instruments	2	\$ 990	\$ 1095
Seminar 216: Dimensional Metrology Quality	1	\$ 530	\$ 585

- Advanced pricing applies when registration is completed more than 2 weeks prior to the class starting.
- The price for Seminar 111 includes the Level 1 and Level 2 tests to earn the Certified Credentials in Dimensional Calibration: General Concepts, Micrometers, and Calipers (a \$325 value).
- A discount of 10% is available when registering more than two students for the same course.
- For cancellation information, please visit our website at www.mitutoyo.com/education.

General Information:

All seminars begin at 9:00 am and conclude at 4:00 pm. Everything you need in class will be provided, including textbooks, paper, pens and pencils. Lunch and beverages are provided. We will try and accommodate any special diet requests with advanced notice. Dress code is casual or business casual – jeans are fine, but no shorts please.



Mitutoyo and the Mitutoyo Institute of Metrology is a worldwide organization. We are proud to state that more than 200,000 engineers, technicians and managers have attended our measurement 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. Please visit our website for cancellation information at www.mitutoyo.com/education.