

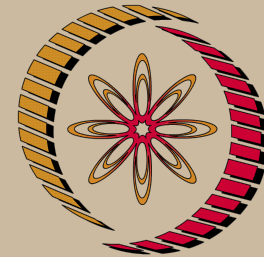
Metrology - Video course

COURSE OUTLINE

In today's world of high-technology products, the most important requirements of dimensional and other accuracy controls are becoming very stringent as a very important aspect in achieving quality and reliability in the service of any product in dimensional control. Unless the manufactured parts are accurately measured, assurance of quality cannot be given. In this context, the course deals with the basic principles of dimensional measuring instruments and precision measurement techniques. The first 2 modules deal with the basic concepts of metrology and measurement standards. Then, linear, angular, geometrical shape metrology along with interferometry techniques and various types of comparators are explained in the subsequent modules. Concepts of limits, fits and tolerances and surface finish measurement, screw thread and gear measurements are also presented in detail. Module 12 deals with metrology of machine tools and advanced metrology respectively.

COURSE DETAIL

Module	Topic	Hours
1	Introduction to metrology: Definition, types, need of inspection, terminologies, methods of measurement, selection of instruments, measurement errors, units, Measurement standards, calibration, statistical concepts in metrology	5
2	Linear metrology: Steel rule, calipers, vernier caliper, vernier height gauge, vernier depth gauge, micrometers, universal caliper	4
3	Limits fits and tolerances : Interchangeability, selective assembly, limits, fit and tolerances, limit gauging, design of limit gauges, computer aided tolerancing	4
4	Measurement of straightness, flatness, squareness, parallelism, roundness and	5



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Mechanical Engineering

Pre-requisites:

This course requires the basic knowledge of the following:

1. Metric and SI units of physical quantities
2. Statistics
3. Trigonometry
4. Basics of manufacturing Engineering

Additional Reading:

1. Dimensional Metrology- Connie L. Dotson, Thomson Learning, 2009
2. Metrology for engineers- Frederick Wise Galyer, Shotbolt, 1990, ELBS
3. Measuring and cutting tools – manufacture and repair, V.Vladimirov, MIR Publisher, Moscow

Hyperlinks:

1. www.nikonmetrology.com
2. www.mitutovo.com

	cylindricity, non-contact profiling systems	
5	Measurement of surface finish: Introduction, terminology, specifying roughness on drawings, surface roughness parameters, factors affecting surface roughness, ideal surface roughness, roughness measurement methods, precautions in measurement, surface microscopy, surface finish softwares.	5
6	Screw thread metrology: Introduction, screw thread terminology, screw thread measurement.	3
7	Gear measurement: Introduction, types of gears, gear terminology, errors in gears, advanced measurement of spur gear.	3
8	Miscellaneous measurements: Taper measurement, angle measurement, radius measurement	3
9	Interferometry: Principle of interference, interference bands, interference patterns, flatness interferometer, Gauge length interferometer	3
10	Comparator: Features of comparators, classification of comparators, different comparators, advanced comparators, thread comparators.	4
11	Metrology of machine tools: Alignment and practical tests	3
12	Advanced Metrology : Advanced measuring machines, CNC systems, Laser vision, In-process gauging, 3D metrology, metrology softwares, Nano technology instrumentation, stage position metrology, testing and certification services, optical system design, lens design, coating design, precision lens assembly techniques, complex opto mechanical assemblies, contact bonding and other joining technologies.	8

3. www.mahr.com
4. www.prismsindia.net
5. www.octagon.co.in
6. www.hemcogages.com
7. www.renishaw.com
8. www.creaform3d.com
9. www.zygo.com
10. www.faro.com
11. www.taylor-hobson.com
12. www.threadcheck.com

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References:

1. Engineering Metrology – K.J. Hume, Macdonald and Co. (publisher) London
2. The Springer handbook of metrology and Testing, Czichos (Ed), 2011
3. The Metrology Hand book- Jay. L. Bucher (ed), American Society for Quality, 2004
4. Industrial Metrology – Smith GT, 2002, Spinger
5. Hand book of industrial metrology – John W. Greve, Frank W. Wilson, PHI – New Delhi
6. Engineering Metrology – D.M. Anthony, Pergamon Press
7. Dimensional Metrology – Khare MK, OXFORD-IBH Publishers