

NIRMA UNIVERSITY

Institute:	Institute of Technology
Name of Programme:	B.Tech. in Mechanical Engineering
Course Code:	2ME102
Course Title:	Metrology and Quality Control
Course Type:	Core
Year of introduction:	2023-24

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Course Learning Outcomes (CLOs):

After successful completion of the course, student will be able to –

- 1 make use of various instruments for linear and angular measurements, (BL3)
- 2 interpret the importance of tolerances and gauging practice, (BL5)
- 3 measure the profiles and surface finish of a given component, (BL5)
- 4 identify suitable quality control tool for given application. (BL3)

Syllabus:

Total Teaching Hours: 30

Unit	Syllabus	Teaching Hours
Unit I	<p>Linear and Angular Measurements</p> <p>Standards of measurement, Line standards, end standards, sources of error in measurement. Various Linear measuring instruments like Calipers, surface plates, vernier height gauge, vernier depth gauges, micrometres, slip gauges. Comparators: classification and characteristics of comparators, uses, working principal, advantages and disadvantages of various types of comparators. Angular measurements: Bevel protector, Sine bars, angle gauges, clinometers, optical instrument for angle measurements, measurement of pressure, temperature, motion, force and torque, Introduction to coordinate measuring machines.</p>	10

Unit II Measurement of Surface Finish: 07

Meaning of surface texture, surface roughness, terminology as per Indian Standards, methods of measuring surface finish, direct instrument measurement, measurement of surface coating thickness, measurement by Light wave interference: Principle and its applications. Measurement of screw threads and gears: Metrology of screw thread: screw thread terminology, effect of pitch errors, measurements of various elements of thread. Gear measurement: Sources of error in manufacturing gears, rolling tests, measurements of various elements

Unit III Limits, fits and gauges 07

Tolerances, limits, fits and allowances, basis of system, hole basis and shaft basis system, types of fits and their interpretation types of gauges and gauge design.

UNIT - IV Fundamental of Quality 06

Definition, need and evolution of quality, dimensions of product and service quality, basic statistical measure / terms, source of variation, chance and assignable causes of variations, process capability, quality assurance, cost of quality, quality control tools.

Self – Study: The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work: Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated

Suggested Readings/References:

1. Galyer J.F.W. and Shot bolt, Metrology for Engineers, Thomson Learning
2. Mahajan M., A Text Book of Engineering Metrology, Dhanpat Rai & Sons
3. Juran J.M. and Gryna Frank M, Quality planning and analysis, Tata McGraw Hill Education.
4. Mitra Amitava., Fundamentals of Quality Control and Improvement, John Wiley & Sons.
5. Grant E.L., Statistical Quality Control, McGraw-Hill Education.
6. Kaoru Ishikawa, Introduction to Quality Control, Modern Productivity and Quality Publishing Pvt. Ltd.

Suggested list of experiments: (not restricted to the following)

Sr. No.	Title	Hours
1.	Dimension measurement using different linear measuring instruments	2
2.	Dimension measurement using indirect instruments and gauges	2

Sr. No.	Title	Hours
3.	Calibration of micrometre using slip gauges	2
4.	Calibration of dial gauge using dial gauge tester	2
5.	Angle measurement using sine bar and vernier bevel protractor	2
6.	Feature measurement using tool maker's microscope	2
7.	Measurement of gear tooth thickness	2
8.	Calibration of tachometer using stroboscope	2
9.	Calibration of Bourdon-tube pressure gauge	2
10.	Measurement of surface roughness of given specimen	2
11.	Observation of fringe pattern using interferometer	2
12.	Measurement of flatness and roundness of given component	2
13.	Alignment test of lathe Machine	2