METROLOGY

Course code	Periods			Total contact hours/ per week	Sessional Marks	Exam Marks	Total Marks	Credits
	L	T	P					
2095503	3	1	0	4	30	70	100	3

COURSE OBJECTIVES:

1. Equip with knowledge of limits, fits, tolerances and gauging
2. Acquire knowledge on linear and angular measurements, Screw thread and gear measurement & comparators.
3. To make the students acquainted with realistic equipment for alignment test

COURSE OUTCOMES:

After completion of this course, the students will be able to

CO 1 Apply the knowledge of limits, fits, tolerances to a machine component and able to select a suitable gauge for inspection during mass production.

CO 2 Make use of relevant instruments to measure the various parameters of screw threads and spur gear.

CO 3 Understand the various methods for measuring geometrical features, angular measurements and able to select comparators for measurement.

CO 4 Analyze the surface texture of a component and can choose a relevant surface testing method.

CO 5 Understand the alignment tests for machine tools and use of CMM for measurement.

Syllabus :

UNIT-I
Limits Fits and Tolerances

Introduction to Metrology, Need of Inspection, Accuracy and Precision

Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly, concept of limits and terminology. hole basis and shaft basis system, types of fits- Clearance, Transition, Interference. Tolerances – Unilateral, bilateral tolerances, geometric and position-tolerances. Classification of gauges, brief concept of design of gauges (Taylor's principle), Wear allowance on gauges, Types of gauges.

UNIT-II
Measurements of screw threads and Gears

Measurement of screw threads- Internal and External threads, Thread terminology

Measurement of - Major diameters, minor diameters and effective diameter, Pitch of the screw threads, Limit gauges for internal and external threads, Tool maker's microscope.
Measurement of Gears – Need of Inspecting the gear tooth, Gear terminology, forms (involute and cycloid) and types of gears. Measurement of pitch, profile and tooth thickness of spur gear.

UNIT-III

Geometrical Feature Measurements, Angular Measurements and Comparators

Geometry Feature Measurement: Slip gauges, Straightness measurement – Straight edge, Wedge Method, Spirit level, Auto-collimator; Squareness testing – Engineers square, indicator method, Optical test using auto-collimator; Flatness measurement - Comparison with the liquid

Dial Indicator, Roundness measuring machine, Bench centre method.

Angular Measurements - Optical bevel protractor, Sine bar, Angle gauges, Angle dekkor. **Comparators -** Twisted strip mechanical comparator, Optical lever comparator, Optical projector, Electric comparator, Pneumatic comparator.

UNIT-IV
Surface Texture

Surface texture: Introduction to surface finish, Factors affecting surface roughness, Order of geometrical irregularities, elements of surface texture, Evaluation of Surface Finish,

Stylus probe instruments - Profilometer, Tomlinson Surface meter and Taylor-Hobson Talysurf for surface roughness measurement.

UNIT-V
Acceptance tests on machine tools and CMM

Alignment tests - for Lathe machine, Milling machine, Radial drill, Alignment test by Laser equipment.

Coordinate Measuring Machine (CMM) – Construction, working and types of Coordinate Measuring Machine.

Text books:

1. A Textbook of Metrology by M. Mahajan, Dhanpat Rai Publications, Delhi.
2. A Textbook of Engineering Metrology, I.C. Gupta, Dhanpat Rai Publications, Delhi.

Reference books:

1. Engineering metrology and measurements by N.V. Raghavendra, Oxford University Press New Delhi.
2. A Textbook of Engineering Metrology, R.K. Jain, Khanna Publishers.