GUJARAT TECHNOLOGICAL UNIVERSITY

B.E Semester: 2

PDDC- MECHANICAL ENGINEERING

Subject Name MECHANICAL MEASUREMENT AND METROLOGY

Sr.No	Course content
1.	Introduction to Metrology: Meaning, Necessity and Objectives of Metrology; Standards of Measurement; Elements of Measuring System; Methods of Measurement; Precision and Accuracy; Sources of Errors; Selection and Care of instruments; Standardizing organizations.
2.	Linear Measurements: Introduction & classification of Linear Measuring Instruments; Least count; Engineer's Steel rule; Callipers; Vernier Calliper: working principle, construction, types & precautions to be taken; Vernier Height Gauge; Vernier Depth Gauge, Micrometers: principle, construction, Sources of errors and precautions to be taken, types of micrometers, Miscellaneous linear measuring instruments like bore gauge, telescopic gauge, slip gauges, Dial indicators: construction & working; comparators; calibration of various linear measuring instruments; Applications, Advantages & Limitations of commonly used linear measuring instruments.
3.	Angular and Taper Measurements: Introduction; Working principle & construction of Angular Measuring instruments like Protractors, Sine bars, Sine centre, Angle gauges, Spirit level, Clinometers, angle dekkor; Applications, Advantages & limitations of commonly used angular measuring instruments; Taper Measuring instruments: Measurement of taper shafts & holes.
4.	Screw Thread Measurements: Introduction & classification of Threads; Elements, Specification & forms of Screw Threads; Various Methods for measuring elements of External & Internal Screw Thread; Screw Thread Gauges; Errors in Threads.
5.	Gear Measurements: Introduction & Classification of gears; Forms of gear teeth; Gear tooth terminology; Measurement and testing of spur gear: Various methods of measuring tooth thickness, tooth profile & pitch; Gear Errors.
6.	Measurement of Surface Finish: Introduction; Surface Texture; Methods of Measuring Surface finish-Comparison Methods & Direct Instrument Measurement; Sample Length; Numerical Evaluation of Surface Texture; Indication of Surface roughness Symbols used; Adverse effects of poor surface finish.

7.	Straightness, Flatness, Square ness, Parallelism and Machine Tool Tests: Introduction; Measurement of Straightness, Flatness, Square ness and Parallelism; run out and concentricity; tool makers microscope; Interferometry & its use in checking flatness, surface contour, parallelism etc.; Interferometers & optical flats; Introduction to Machine tool testing; Various Alignment test on lathe, Milling Machine, Drilling Machine etc.
8.	Basic Concepts of Measurements: Introduction, Measurement and it's aim; Generalized Measurement system; Performance Characteristics –static & dynamic characteristics of instruments, types of measurement system , Transducers, Instrumental error & its analysis.
9.	Temperature Measurement: Introduction; Temperature and Temperature Scales; Methods of temperature Measurement; Expansion thermometers; Filled System thermometers; Electrical temperature measuring instrument; Pyrometers; Calibration of temperature measuring instruments.
10.	Pressure Measurement: Introduction; Pressure standards and methods of pressure measurement; Manometers; Elastic pressure transducers; Measurement of Vacuum; Force balance pressure gauges; Electrical pressure transducers; pressure switches; Calibration of pressure measuring instruments, Maintenance and repair of pressure measuring instrument; Trouble shooting.
11.	Miscellaneous measurement: Measurement of force, torque, power, displacement, velocity, acceleration, speed, frequency.

Reference Books:

1. Mechanical Measurement and Metrology by R K Jain, Khanna Publishers
2. Mechanical Measurement & Control by D.S. Kumar.
3. Industrial Instrumentation & Control by S K Singh, Tata McGrawHill
4. Mechanical Measurements by Beckwith & Buck, Narosa publishing House