



**Subject Code: 09ME1403**

**Subject Name: Mechanical Measurement and Metrology**

**Semester – IV**

**Objective:** This subject introduces in mechanical to understand the fundamental of the measurements. In industries, as processing and manufacturing techniques have become complex and complicated so for mechanical engineer, their control is very much difficult by judgment only. Therefore, the exact and precise measurements are the basic need of the industries. This subject gives knowledge and skill to students so that they can work on shop floor independently for accurate and precise measurements and manufacturing.

**Credits Earned:** 2 Credits

**Course Outcomes:**

By learning this subject student will be able...

- To measure various elements and assemblies using linear and angular instruments.
- To check geometrical accuracy of given component.
- To measure and derive important dimensions of thread forms and gear.
- To check dimensions using various gauges.
- To measure temperature of various bodies.
- To measure fluid flow and pressure.

**Teaching and Examination Scheme**

Teaching Scheme (in Hrs)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA	(CSE)	Viva (V)	Term work (TW)	
0	0	4	2	00	30	20	25	25	100



**Contents:**

<b>Sr.no</b>	<b>Content</b>	<b>Total hrs.</b>	<b>%weightage</b>
1	Linear and angular measurement: Introduction to metrology, definition of accuracy, precision and error. Linear measurement-principal of Vernier scale and least count, types, constructional sketch, major parts and their functions, least count, measuring methods for various linear measuring instruments (Vernier gauge, height gauge, depth gauge, micrometer). Slip gauge types, applications, and wringing method. Angular measurement- types, constructional sketch, major parts and their functions, least count, measuring methods for various linear measuring instruments (Bevel protector, Sine bar, Angle gauge, Sprit level, Auto collimator)	14	22
2	Geometric tolerances: Dial gauges- types, construction and applications. Definition, symbol and measuring method of various geometric tolerances (Straightness, Squareness, Flatness, Parallelism, Perpendicularity, Roundness, Concentricity, Cylindricity, Run out and Ovality)	8	10
3	Metrology of Gear and Thread: Types of gears, gear terminology, Sketch, major parts and their functions, least count, measuring methods and measurement illustration of Gear Tooth Vernier. Threads-classification, elements, specifications and forms, measurement of major and minor diameters, Pitch measurement methods.	14	22
4	Limit gauges and Transducers: Limit gauges- types, sketch, construction and working. Transducers-concept, classifications, physical quantities which can be measured, advantages and disadvantages. Electrical transducers-types, working principles and applications.	8	19
5	Temperature, pressure and flow measurement: Classification, working principle, construction, working, advantages, limitations and applications of temperature measuring devices (Thermometer, Thermistor, Thermocouple) Types and applications of manometers, working principle, construction, working, and applications of various pressure gauges. Flow measurement using Venturi meter and Orifice meter and Rotameter.	8	19
6	Miscellaneous Metrology: Coordinate measuring machines-Structure, Modes of Operation Probe, Operation and applications. Optical Measuring Technique- Tool Maker's Microscope, Profile Projector, Optical Square.	4	8



**References:**

1. Mechanical Measurements and Instrumentations, R K Rajput, Kataria Publication(KATSON)
2. Mechanical Measurement and Metrology by R K Jain, Khanna Publisher.
3. Mechanical Measurement & Control by D.S. Kumar.
4. A Text book of Engineering Metrology, I C Gupta, Dhanpat Rai Publications.
5. Industrial Instrumentation & Control by S K Singh, McGraw Hil

**Suggested list of Lab Experiments:**

1. To study various linear measuring instruments and its measuring practice
2. To study various angular measuring instruments and its measuring practice
3. To study and measuring of various geometrical tolerances
4. To study gear terminology and measuring methods for various parameters
5. To study thread form terminology and measuring methods for various parameters
6. To study use of limit gauges
7. To study about various transducers
8. To study about temperature measurement
9. To study about pressure and flow measurement
10. To study about miscellaneous measuring instrument
11. Mini project

**Instructional Method:**

- a. The course delivery method will depend upon the requirement of content and need of students.
- b. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory.
- d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory