

Course Title	MECHANICAL MEASUREMENT AND METROLOGY
Course Code	ME407
Course Credit	Lecture : 03
	Practical : 01
	Tutorial : 00
	Total : 04

Course Learning Outcomes:

After Successful completion of the above course, students will be able to:

- **Explain** different measuring instruments to measure the qualitative and quantitative characteristics of different mechanical components.
- **Differentiate** the accuracy of instruments.
- **Evaluate** quality of job, machine and instruments.
- **Perform** calibration of measuring instruments.

Detailed Syllabus

SECTION-I

Sr. No.	Name of chapter & Details	Hours Allotted
1	Introduction to Metrology: Definition and concept of metrology, Need of inspection, Principles of measurement, Process of measurement, Methods of Measurement, Classification of measuring instruments, Selection of measuring instruments, Measuring systems and accuracy of measurement, Precision and accuracy, errors in measurement.	04
2	Standards of Measurement: System of measurement, Material Standard, Wavelength Standards, Subdivision of standards, Line and End standards, Classification of standards and Traceability, calibration of End bars, standardization and standarding organization.	03
3	Linear Measurement: Constriction, working principle, measurement procedure, error and its elimination, limitations, calibration and application of different linear measuring instruments, like Steel rule, calipers, surface plates, tool maker's flats, angle plates, V block, Straight edge, Spirit level, combination square, Engineer's square. Slip gauge, wringing of slip gauge, Indian standards on slip gauge, selection of slip gauges, care of slip gauge, slip gauge accessories, adjustable slip gauges, Gauges for internal measurement like Telescopic gauge,	05

	<p>Comparators: Introduction; need of comparators, basic principles of operation, uses, essential characteristics, classification of comparators; mechanical, optical, mechanical optical, pneumatic, fluid displacement</p>	
4	<p>Angular Measurement: Construction, working principle, measurement procedure of sine bar, Taper measurement, application of angle gauge.</p>	02
5	<p>Screw Thread Measurement: Terminology, Classification, Forms of thread, Errors in thread, Measurement of various Elements in threads like major diameter, minor diameter, effective diameter. Measurement of pitch, screw thread gauges, Screw pitch gauge</p>	04
6	<p>Gear Metrology: Introduction: source of error in manufacturing of gears, Spur gear measurement, chordal thickness method; constant chord method; measurement over rollers; Parkinson gear tester.</p>	03
Total		21
SECTION-II		
7	<p>Introduction to Measurements: Functions of instruments, Generalized Measurement system and its functional elements, static & dynamic characteristics of instruments.</p>	03
8	<p>Temperature Measurement: Introduction, temperature scale, classification of temperature measuring instruments. Construction, working principle, measurement procedure, error and its elimination, limitations, calibration and application of different temperature measuring instruments like thermometer, thermister and pyrometer.</p>	05
9	<p>Pressure Measurement: Introduction, terminology, pressure unit, classification. Construction, working principle, measurement procedure, error and its elimination, limitations, calibration and application of different pressure measuring instruments like mechanical displacement type gauge, Burdon gauge, diaphragm gauge, bellow gauge,</p>	05
10	<p>Force, Torque and Power Measurement: Direct methods and indirect method, force measuring inst. Torque measuring inst., Types of dynamometers, Absorption dynamometer, prony brake and rope brake dynamometer, and power measuring inst. Etc.</p>	05
11	<p>Measurement of Surface Finish: Introduction; Different surface texture, elements of surface texture, factors affecting surface finish, reasons for controlling surface texture, methods of measuring surface finish, indication of surface roughness symbols used.</p>	03

Total	21
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Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory. Minimum two internal exams will be conducted and average of two will be considered as a part of overall evaluation.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures. Minimum eight experiments shall be there in the laboratory related to course contents.

Reference Books:

1. Mahajan M. S., "Textbook of Metrology", Dhanpatrai publication.
2. Kumar, D.S., "Mechanical Measurements and Control", Metropolitan, New Delhi.Kumar,
3. D.S., "Mechanical Measurements and Control", Metropolitan, New Delhi.
4. Doeblein, E.O., "Measurement Systems, Application Design", McGraw Hill.
5. Alan S. Morris, " Measurement and instrumentation principle"
6. R. K. Jain, "Engineering Metrology", Khanna Publication.
7. R. K. Rajput, "Engineering Metrology and Instrumentation", S. K. Katariya& Sons.
8. Beckwith Thomas G., "Mechanical Measurements", Narosa Publishing House, N.Delhi.
9. I.C.Gupta, "A Text book of Engineering Metrology", DhanpatRai and Sons.
10. J.P.Hadiya, H.G.KATARIYA, "Mechanical Measurement and Metrology", Books India Publications, Ahmedabad
11. A J Lissaman, S J Martin, S C Black, V Chiles, "Principle of Engineering Manufacture" Viva Books Private limited : New Delhi, Mumbai, Chennai
12. Anand K Bewoor, Vinay A Kulkarni, Metrology and Measurement, McGraw Hill

Additional Resources:

http://nptel.iitm.ac.in/courses/IIT-MADRAS/Mechanical_Measurements_Metrology/index.php