

Branch Name:	Mechanical Engineering
Program Code:	ET101
Course Name:	Measurements and Metrology Practical
Course Code:	2ET1010404P
Pre-requisite Course:	Zeal to Learn the Subject

Course Objectives:

1. To introduce various techniques and instrumentation used in mechanical measurement and metrology.
2. To help students to learn, select and use different measuring instruments for measuring the qualitative and quantitative characteristics of different mechanical objects.
3. To help students to learn how to measure various parameters/quantities which are associated with the practical objects by selecting proper instruments and to take corrective action for minimizing and eliminating deviations.
4. To implant the awareness in students to calibrate the measuring instruments as per national and international standards for accurate measurement of the quantity.

Teaching and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								
					Theory (Marks)				Practical (Marks)				Total (Marks)
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
01	-	-	02	02	-	-	-	-	10	25	10	25	50

Course Contents

Sr. No.	Detail of Practical's	Contact Hours
1.	Measurement of external, internal and depth dimensions by vernier caliper and dial vernier calliper.	02
2.	Measurement of external and internal dimensions by outside micrometer and inside micrometer.	02
3.	Measurement of various dimensions by height gauge and depth gauge.	02
4.	Measurement of internal dimensions by telescopic gauge and Demonstrate use of slip gauges/gauge blocks.	02
5.	Calibration of vernier calliper and micrometer using gauge blocks/slip gauges as standard.	02
6.	Measurement of angle by bevel protector.	02
7.	Measurement of angle by sine bar and slip gauges.	02
8.	Measurement of roundness using dial gauge combination and draw polar diagram.	02
9.	Measurement of straightness by wedge method and Flatness measurement by dial gauge.	02
10.	Measure the gear tooth thickness of spur gear with the help of gear tooth vernier caliper.	02
11.	Measure the different elements of screw thread by screw thread micrometer.	02
12.	Demonstration of surface roughness measurement.	02
13.	Calibration of pressure gauge using dead weight gauge tester.	02

14.	Demonstration of temperature measuring instruments.	02
15.	Demonstrate the use of various limit gauges, feeler gauge, radius gauge, thread pitch gauge etc.	02

Note: At least ten practical should be covered in laboratory work from the above suggested list.

Reference Books:

1. Mahajan M. "A Text Book of Metrology", DhanpatRai Publications, New Delhi
2. Kumar D.S. "Mechanical Measurement and Control", Metropolitan book Co.
3. Jain R.K. "A Text Book of Engineering Metrology", Khanna Publisher
4. Doeblin E.O. "Measurement Systems", McGraw-Hill, 2004
5. Holman J.P. "Experimental Methods for Engineers", Tata McGraw Hill publications
6. Rajput R.K. "Mechanical measurement and instrumentation", S.K. Kataria & Sons
7. Gupta I.C. "A Text book of Engineering Metrology", DhanpatRai Publications
8. Sawhney A.K. "A course in Mechanical Measurements and Instrumentation", Dhanpat Rai Publication.

E-Resources:

1. Mechanical Measurements and Metrology by Prof. S P Venkateshan (IIT Madras), NPTEL Course (Link: <https://nptel.ac.in/courses/112/106/112106138/>).
2. Principles of Mechanical Measurement by Prof. Dipankar N Basu (IIT Guwahati), NPTEL Course (Link: <https://nptel.ac.in/courses/112/103/112103261/>).

Course Learning Outcomes (CLO):

CLO	Description	Bloom's Taxonomy Level
CLO1	Explain the basic principles underlying instruments associated errors and their remedies.	2 Understanding
CLO2	Understand importance of accurate and precise measurement in manufacture industries.	1 Remembering
CLO3	Apply the basic concepts learned in developing metrology instruments.	3 Applying 4 Analyze
CLO4	Understand importance of measurements for analysis of other mechanical subjects like production and manufacturing, machine design, industrial engineering, fluid power engineering etc.	2 Understanding 6 Creating
CLO5	Follow the instructions to calibrate and use metrology instruments.	5 Evaluating
CLO6	Select the appropriate instrument for practical applications.	3 Applying

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CLO1	H	L					M				M	L	L	
CLO2	M		H		M					L	M		M	
CLO3		M	H		H			L			M			
CLO4	H	H			L	M	M	M		L		H	L	
CLO5	M	M			H		L	L	M	M		L		M
CLO6			M		H	L			L			M		L

H: High, M: Medium, L: Low