GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology		Branch/Spec.	Mechatronics Engineering	
Semester	VI		Version	2.0.0.0	
Effective from Academic Year	2016-17		Effective for the batch Admitted in		June 2014
Subject code	2ME 505	Subject Name	MECHANICAL MEASUREMENT AND METROLOGY		

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	25	25	50

Pre-requisites:

Learning Outcome:

After learning this course, student should be able to:

- Understand the meaning of the three main purposes of measurement, i.e. To control the production process, the product function and the product design, and how to select appropriate measurement quantities and tools for these purposes.
- Have knowledge about different measurement methods and instruments, both traditional and modern that is used in the industry to measure product dimensions, shape and surface structure.
- Have ability to handle and interpret measurement data, to estimate measurement uncertainties and to achieve and present traceable measurement results.

Theory syllabus

Unit	Content	Hrs
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.	3
2	**Linear Measurements:** Introduction & classification of Linear Measuring Instruments; Least count; working principle, Sources of errors and precautions to be taken, Vernier Height Gauge; Vernier Depth Gauge, Micrometers ;slip gauges, Dial indicators: construction & working; comparators; calibration of various linear measuring instruments; Applications, Advantages & Limitations of commonly used linear measuring instruments.	5
3	**Angular and Taper Measurements:** Introduction; Working principle & construction of Angular Measuring instruments like Protractors, Sine bars, Applications, Advantages & limitations of commonly used angular measuring instruments; Taper Measuring instruments: Measurement of taper shafts & holes.	5
4	**Limits, Fits and Tolerances:** Limits, fits, and dimensional and geometrical or form tolerances, Gauges including their design IS for plug & ring gauges, Interchangeable manufacturing.	4
5	**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.	4
6	**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.	4
7	**Measurement of Surface Finish:** Introduction; Surface Texture; Methods of Measuring Surface	3

	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.	
8	**Motion Measurement:** Measurement of displacement, velocity, acceleration and vibrations by potentiometer, strain gauges, seismic pickups, velocity pickups and acceleration pickups, calibration of pickups.	3
9	**Force:** Torque and shaft power measurement, Basic method of force measurements, elastic force transducers, torque measurement on rotating shaft, shaft power measurement.	3
10	**Pressure measurement:** Basic method of pressure measurement, dead weight gauges and manometers, elastic transducers and force balance transducer.	3
11	**Flow measurement:** Gross flow rate measuring meters, constants area, variable pressure drop meters (obstruction meters) constant pressure drop variable arc meters (Rotameter), local flow velocity magnitude and direction meters, pitot static tube and vawtube, Hotwire anemometer velometer.	4
12	**Temperature measurement :** Measurement of temperature by liquid – in – glass thermometers, pressure thermometers, thermocouples, their calibration, resistance thermometer, bimetallic thermometer, thermistors, radiation and optical pyrometers.	4

Practical content	
The Practical/term work shall be based on the topics mentioned above and will be defended by the candidates.	
Text Books	
1	R.K. Jain, Khanna Publishers - A Text Book of Engineering Metrology
2	M.Mahajan, Dhanpat Rai, New Delhi - A Text Book of Metrology
3	D.S. Kumar, Metropolitan book Co. - Mechanical Measurement & Control
4	R.K.Rajput, S.K.Kataria & Sons. - Mechanical measurement and instrumentation
Reference Books	
1	Dotson & Connie, Cengage Learning India Pvt. Ltd. - Dimensional Metrology
2	By C.Elanchezhian, Eswar Press, Chennai - Engineering Metrology
3	I.S. 919 Recommendation for limits and fits for engg.
4	Galyer & Shotbolt (Elbs) - Metrology for Engineers
5	K.J. Hume, Kalyani Publisher - Engineering Metrology
6	Thomas G. Beckwith, Pearson Edu. - Mechanical Measurement
7	S.P.Venkateshan, Ane Books India - Mechanical Measurement
8	Nakra & Chaudary,Tata McGraw Hill - Instrumentation, Measurements and Control
9	I.C. Gupta, Dhanpat Rai and Sons. - A Text Book of Engineering Metrology