GUJARAT TECHNOLOGICAL UNIVERSITY
AUTOMOBILE ENGINEERING
B. E. SEMESTER: VII

Subject Name: **Automotive Mechanical Measurements**
Subject Code: **170204**

Teaching Scheme				Evaluation Scheme			
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (E)**		**Mid Sem Exam (Theory) (M)**	**Practical (Internal)**
				Theory	**Practical**		
3	0	2	5	70	30	30	20

Sr. No.	Course Contents	Total Hrs
	METROLOGY	
1.	**Introduction :** Need of measurement, International standards of length - Line and end measurement, slip gauges. Precision & accuracy of measurements. Possible errors and Sources of errors in measurement.	3
2.	**Tolerances and Gauging:** Unilateral and bilateral tolerances, Limits, Fits. Types of Fits. Importance of limits. Systems followed in mass production. Limit gauges used for plain and taper works. Specifications of limits as per IS (Indian Standards).	4
3.	**Magnification :** Principles and characteristics of measuring instruments, Mechanical, Optical, Electrical and Pneumatic. Methods of magnification. Different types of Vernier calipers, Micrometers, Dial gauges, Mechanical and pneumatic types of comparators. Use of comparators in inspection.	3
4.	**Straightness and Flatness:** Straight edge, use of level beam comparator, autocollimator testing of flatness of surface plate.	3
5.	**Surface Finish:** Types of textures obtained during machine operation, range of C.L.A. value in different operations in numerical assessment of surface finish (B.I.S. Specifications of C.L.A. value)-sample length of different machining operations, Direction of lay, texture, symbols, instruments used in surface finish assessment.	4

	INSTRUMENTATION & MEASUREMENT	
6.	**Introduction** Need of Mechanical Measurement. Measurement methods, Generalized measurement system and its functional elements. Instrument characteristics: static, dynamic and analytical treatment, calibration, Classification and various types of transducers. 3 Coordinate measuring machine	3
7.	**Measurement of Angles, Taper and Radius:** Bevel Protractor, Spirit level, Clinometers, angle Decker, standard balls and rollers for angle measurement, angle slip gauges, and radius measurement of circular portion, measurement of concave and convex surface radius. **Measurement of Threads:** Different errors in screw threads, measurement of forms of thread with profile projector, pitch measurement, measurement of thread diameter with standard wire, screw thread micrometer. **Measurement of Spur Gears:** Run out checking, Pitch measurement, profile checking, backlash checking, tooth thickness measurement, alignment checking, errors in gears, checking of composite errors.	6
8.	**Measurement of Temperature:** Importance, Principle and types of temperature measurement, Thermometer, Thermocouple, calibration, RTD, Thermister, measurement of low temperature. Measurement of coolant temp, engine oil temp, exhaust gas temp, cabin temp. **Measurement of Pressure and Vacuum:** Importance of pressure and vacuum measurement, range of high pressure and vacuum. Type of pressure measuring instruments - Bourdon tubes, Dead weight pressure gauge tester, Diaphragm gauge, LVDT, Piezo electrical pressure gauge, low vacuum gauges-McLeod gauge. Measurement of Atmospheric pressure, exhaust gas pressure, air pressure in reservoir tanks of Air Brake system and hydraulic braking system, coolant pressure, fuel delivery pressure and engine oil pressure.	5
9.	**Measurement of Angular Speed:** Importance of angular speed measurement, mechanical tachometers, Electrical tachometers-Drag cup, Tacho generator, Inductive, capacitive and photo electric pick up. Contact type & Non Contac type Tachometer. **Measurement of Flow:** Importance of flow measurement for Coolant, Lubrication Oil & Fuel, Water meter, Rota meter, Gas flow meter, Hot wire anemometer, drag press flow meter (analytical treatment).	6

	Measurement of Strain: Classification of strain gauges, principle and types of electrical strain gauges, gauge factor, analysis of whetstone's network using strain gauges, mounting, application to measure – load / force, torque. Usage of Torque wrench.	
10.	**Measurement of Vibration and Sound:** Importance of vibration measurement, classification of vibration measuring instruments, accelerometer, importance of acoustical measurement, sound pressure and power levels, types of microphones - capacitive, crystal, electrodynamics, carbon, sound level meter. Harshness measurement. **Other Measurements:** Thermal conductivity gauge, Pitot gauge, Ionization gauge, Crank position, Cam position.	6
11.	**Calibration:** Process, Mandatory requirements of Calibration, Certification, validity of certificate.	2

Term Work:

The term work shall be based on the topics mentioned above.

Text Book:

1. Engg. Metrology by R.K.Jain, Khanna Publishers, Delhi.
2. Mechanical Measurements and Control by D.S.Kumar, Metropolitan books.

Reference Books:

1. Text Book of Engg. Metrology by I.C. Gupta, Dhanpat Rai & Sons, New Delhi.
2. Mechanical Measurement & Instrumentation by R.K.Rajput, S.K.Kataria & Sons.