ME283: Mechanical Measurement

Teaching Scheme			Credits	Marks Distribution				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE	CE	ESE	CE	
3	0	2	5	70	30	30	20	150

Course Content:

Sr. No.	Topics	Teaching Hrs.
1	**Basic Concepts of Measurements:** Introduction to measurement and measuring instruments, Methods of measurement, Modes of measurement, generalized measuring system and functional elements, instruments and its classifications, Sensors and Transducer and its classification, Static and dynamic performance characteristics of measurement devices, sources of error in measurement, classification and elimination of errors, uncertainty in measurements.	08
2	**Displacement Velocity/Speed, and Acceleration Measurement:** Working principal of Resistive Potentiometer, Linear variable differential transducers, Electro Magnetic Transducers, Mechanical, Electrical and Photoelectric Tachometers, Piezoelectric Accelerometer, Seismic Accelerometer.	07
3	**Pressure Measurement:** Pressure standards and methods of pressure measurement; Manometers; Elastic pressure transducers; Measurement of Vacuum; Force balance pressure gauges; Electrical pressure transducers; pressure switches; Calibration of pressure measuring instruments.	07
4	**Temperature Measurement:** Methods of temperature Measurement; Expansion thermometers: Bi-metallic, Liquid in glass; Filled System thermometers; Electrical temperature measuring instrument: Thermocouples, RTD, Thermistors; Pyrometers; Calibration of temperature measuring instruments.	08

5 **Measurement of Force, Torque, Power:** 06

Force measurement: Hydraulic force meter, Pneumatic force meter, Strain gauge load cell, cantilever beams, proving rings, and differential transformers.

Measurement of torque and power: Prony brake dynamometer, Rope brake dynamometer, Hydraulic dynamometer, Eddy current dynamometer, Torsion bar dynamometer, Servo-controlled dynamometer.

6 **Measurement of strain:** 06

Mechanical strain gauges, electrical strain gauges, strain gauge: materials, gauge factors, theory of strain gauges and method of measurement, bridge arrangement, temperature compensation.

7 **Miscellaneous Measurements:** 07

Flow measurement: Rota meter, magnetic, ultrasonic, turbine flow meter, hot – wire anemometer, Laser Doppler Anemometer (LDA), Pitot-static tube.

Viscosity measurement: Viscometers.

Fuel and fuel gas analysis: Calorific value and its measurements: Junker and Bomb calorimeters, Flash and fire points, Gas analyzer.

Total Hrs. 49

Reference Books:

1. D.S. Kumar, "*Mechanical Measurement & Control*", 4th Edition, Metropolitan Book Co, New Delhi, 2006.
2. B.C.Nakra and K.K.Choudhary, "*Instrumentation measurement and analysis*", 3rd Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2009.
3. A.K.Sawhney and Puneet Sawhney, "*Mechanical Measurement and Instrumentation & Control*", 12th Edition, Dhanpat Rai & Co, 2009.
4. S. K. Singh, "*Industrial Instrumentation and Control*", 3rd Edition, McGraw Hill Education (India) Private Limited, New Delhi, 2009.
5. R. K. Rajput, "*Mechanical Measurements and Instrumentation*", 2nd Edition, S K Kataria & Sons, New Delhi, 2006.
6. Thomas G. Beckwith, Roy D. Marangoni, John H. and Lienhard V, *"Mechanical Measurements*", 6th Edition, Addison Wesley.