

UEIXXX INDUSTRIAL INSTRUMENTATION

L	T	P	Cr
3	1	0	3.5

Metrology (Measurement of Length, Angle and Area): Dimensional measurement, Vernier caliper, Dial gauges, Gauge blocks, Optical flats, Sine bar, Angle gauges, Planimeter, Comparators, Flatness measurement.

Motion and Vibration Measurement: Translational and rotational displacement using potentiometers, Strain gauges, Differential transformer, Synchros and induction potentiometer, Capacitance, Digital displacement transducers, Photo elastic, Moir- fringe, Holographic technique, Different types of tachometers, Accelerometers, Gyros. Force, Torque and Shaft Power Measurement: Elastic, Vibrating wire, Gyroscopic force transducers, Torque measurement in rotating shafts, Gyroscopic torque measurement, Shaft power measurement (Dynamometers).

Pressure and Sound Measurement: Moderate pressure measurement, Bourdon tube, Bellows and diaphragms, High pressure measurement: Piezoelectric, Electric resistance, Low pressure measurement: Mcleod gauge, Knudsen Gauge, Viscosity gauge, Thermal conductivity, Ionization gauge, Dead weight gauges, Sound level measurement using different types of microphones.

Flow Measurement: Obstruction meter, Orifice, Nozzle, Venturi, Pitot tube, Annubar tubes, Target, Rotameter, Turbine, Electromagnetic, Vortex, Positive displacement, Anemometers, Weirs and flumes, Laser Doppler anemometer, Ultrasonic flow meter, Fluidic oscillator, Mass flow meter, Flow visualization.

Temperature Measurement: Bimetallic thermometers, Liquid-in-glass, Pressure thermometer, Thermocouples, RTD, Thermistors, Semiconductor sensors, Digital thermometers, Pyrometers.

Level Measurement: Visual level indicators, Ordinary float type, Purge method, Buoyancy method, Resistance, Capacitance and inductive probes, Ultrasonic, Laser, Optical fiber, Thermal, Radar, Radiation.

Miscellaneous Measurements: Humidity, Dew point, Viscosity, Thermal and nuclear radiation measurements.

COURSE LEARNING OUTCOME (CLO):The student will be able to

1. Explain the basic concepts of metrology.
2. Describe the construction and working of different type of devices used to measure motion, vibration, pressure, sound, temperature, level and flow.
3. Elucidate different methods for the measurement of, humidity, viscosity and nuclear radiation etc.
4. Select the appropriate instrument/transducer for a given application/parameter.

Text Books:

1. Doebelin, E.O., *Measurement systems, Applications and Design*, McGraw-Hill (1982).

2. *Nakra, B. C. and Chaudhry, K. K., Instrumentation Measurement and Analysis, Tata McGraw–Hill (2003).*

Reference Books:

1. *Murthy, D.V.S., Transducers and Instrumentation, Prentice–Hall of India Private Limited (2003).*
2. *Sawhney, A.K., A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai and Co. (P) Ltd. (2007).*

Evaluation Scheme:

Sr. No.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	45
3	Sessionals (May include Assignments/Projects/Tutorials/Quizzes/Lab Evaluations)	25