GUJARAT TECHNOLOGICAL UNIVERSITY

DIPLOMA IN INSTRUMENTATION & CONTROL

Semester: 4

Subject Name PROCESS INSTRUMENTATION-I

Sr.No	Course content
1.	**BASIC PRINCIPLES OF MEASUREMENT :** 1.1 Importance of Measurement 1.2 Definition of accuracy, precision, sensitivity, resolution, error, repeatability etc. 1.3 Fundamental and derived units 1.4 Error classification 1.5 Standards of measurements 1.6 Performance characteristics.
2.	**PRESSURE MEASUREMENT :** 2.1 Importance of pressure measurement in process industries 2.2 Types of pressure : static, dynamic, absolute, differential, atmospheric, gauge pressure, vacuum 2.3 Manometers : U type, well and inclined type, ring type 2.4 Pressure sensing elements : Bellows, Diapharagm, Capsule 2.5 Dead weight tester 2.6 Vaccum sensors ;- Thermal Conductivity gauge, Pirani Gauge,Ionization Gauge 2.7 McLeod's gauge 2.8 Pressure switches 2.9 Need of pressure seals, Types of pressure seals 2.10 Electrical methods for pressure measurement ;-, LVDT type, strain gauge, Piezo electric type , Variable Capacitance type. 2.11 Pneumatic Pressure and differential pressure transmitter (Force Balance type) 2.12 Electronic differential pressure transmitters ;- Capacitive and Strain Gauge type.
3.	**FLOW MEASUREMENT** 3.1 Importance of flow measurement 3.2 Basic characteristics and physical properties of fluid for flow measurement – namely specific gravity, density, viscosity, compressibility, effect of pressure & temperature on flow measurement Types of Flow ;- Turbulent and Laminar , Reynolds's number 3.3 Measurement of flow rate in closed pipe using Bernoulli's theorem, Derivation of flow equation, discharge coefficient. 3.4 Measurement method : Inferential (Obstruction type) method for rate of flow ;- orifice plate, flow nozzle, venture tube. Pitot tube, Variable Area meters or Rotameter (Glass tube and metal tube type)

	3.5 Special flow meters –Magnetic and Ultrasonic flow meters, Weirs and flumes in brief. 3.6 Brief description of operation with simple sketches of Turbine flow meter,target flow meter, vortex flow meter, flow switches. 3.7 Positive displacement meters, weigh feeder system. 3.8 Flow integrators, pneumatic and electronics flow transmitters.
4.	**MISCELLANEOUS MEASUREMENT** : **4.1 MEASUREMENT OF SPEED** 4.1.1 Mechanical tachometer 4.1.2 Electrical tachometer generator - Direct current tachometer - A. C. tachometer generator - Photo-electric sensor type - Induction sensor type - Magnetic speed sensor type **4.2 MOISTURE AND HUMIDITY MEASUREMENT** 4.2.1 Wet and dry bulb type hygrometer method 4.2.2 Hair hygrometer method 4.2.3 Thin film capacitance type hygrometer method 4.2.4 Electrolytic hygrometer method 4.2.5 Infrared absorption hygrometer method

Reference Books:

1. Industrial Instrumentation D. P. Eckman
2. Process Measurement and Analysis B. G. Liptak
2. Instrument Technology E.B.Jones
3. Industrial Instrumentation Fribance
4. Industrial Instrumentation S.K.Singh
5. Mechanical Measurements D. S. Kumar