

4218 - INDUSTRIAL INSTRUMENTATION

Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)			
Lectures	Practical	Credits			Theory	Practical Ex.	Total	
3	2	5	25	25	3 Hrs	100	50/or	200
Pre-requisite		Source			Theory	Test	Total	TW
4216		INC	Semester		75	25	100	25
								PR
								Gr Total
								175

Rationale: Measurements of various parameters are being carried out regularly in the industries during the day-to-day processes. The major parameters that are often measured are Temperature, Pressure, Flow and Liquid Level. This course deals with the various measurement techniques used in the field for the above parameters. It also provides for the practical application of Industrial systems using these parameters in modern industries.

COURSE CONTENTS	Hrs.	Mks.
1. FLOW MEASUREMENTS	14	25
Bernoulli's Theorem and its derivation, Inferential type flow measuring methods. Working Principle, Principle of operation and Application of the following flow-meters: -Differential Head Meters, Variable area meters, Magnetic Meters, Turbine Meters, Vortex Meters, Ultrasonic Flow-meters. Quantity Flowmeters (Mention). Concept of Mass Flow-meters (In Brief). Open channel flow measurement (In Brief). Calibration Techniques for flow-meter:- Liquid meters & Gaseous meters		
2. TEMPERATURE MEASUREMENTS	10	15
Temperature Scales. Non-Electrical methods for measurement of temperature: - Bimetallic Thermometer, Liquid in Glass, Pressure Thermometers. Electrical methods for measurement of temperature: -Thermistors, RTD, Thermocouple, Radiation methods. Two wire, three wire and four wire RTD and its applications. Calibration techniques for temperature transducers and typical specification of each.		
3. PRESSURE MEASUREMENTS	10	20
Different types of pressure. Manometers: - U tube Manometer; Well type Manometer, Inclined Manometer, Micromanometer. Measurement of Vacuum: - Capsule Gauge, Pirani Gauge, Thermocouple Vacuum Gauge, McLeod Gauge. Elastic pressure Transducers: - C Type Bourdon tube, Diaphragm, Bellow Gauge, Dead Weight Piston Gauge. Pressure Converters: -Pneumatic to Electric Current Converter, Current to Pneumatic Converter, Voltage to current converter. Differential Pressure Transmitter. Calibration Techniques for pressure Gauges		
4. LEVEL MEASUREMENTS	10	20
Direct Methods: - Hook type; Sight Glass; Float Type; Displacer level Detectors. Indirect Methods: - Hydrostatic Pressure Methods; Pressure Gauge Method; Air Purge System. Electrical Methods: - Resistive; Inductive; Capacitive; Level Measurement with Gamma Rays. Ultrasonic Methods.		
5. PRACTICAL APPLICATIONS	4	20
Practical applications using the closed loop system for the following parameters; Flow; Temperature; Pressure; Level.		
Total	48	100

LIST OF PRACTICALS

(Minimum ten)

- To determine the coefficient of discharge for an orifice plate.
- To determine the coefficient of discharge of an venturimeter using the braking torque method.
- To calibrate the coefficient of discharge of any one type of weir.
- To built and test a circuitry of a liquid level indicator
- To determine the multiplication error of a C type Bourdon tube
- To observe the Electric to Pneumatic signal conversions using a E/p converter
- To observe the temperature scanning technique using a Thermocouple temperature scanner
- To observe the temperature scanning technique using a RTD temperature scanner.
- To study the characteristics of Air-Flow Transducer using the RTD.
- To study the Characteristics of Air pressure Transducer.
- To study the characteristics of the Humidity Transducer.

TEXT BOOKS:

- Instrumentation Measurement & Analysis by Nakra Choudhry
- Instrumentation Measurement & Control by S.K. Singh

REFERENCE BOOKS:

Principle of Industrial Measurements for Control Applications by Ernest Smith

Signature