PROCESS INSTRUMENTATION

Course Code : 15CH1112

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Course Outcomes:

On successful completion of the course, the student should be able to

CO 1 Identify the various elements and characteristics of an instrument required for measuring process variables.

CO 2 Recall the working principles of different instruments required for measuring temperature, pressure, composition, level, flow rate, density and viscosity.

CO 3 Describe the construction and working limitation of an instrument for measuring a process variable.

CO 4 Compare and choose the appropriate instrument for measuring a given process variable based on its working principle and measuring range.

CO 5 Apply the necessary method of monitoring the variable for controlling and efficient running of the process.

UNIT-I **(10 Lectures)**

Elements of instruments, static and dynamic characteristics, basic concepts of response of first order type instruments, mercury in glass thermometer, bimetallic thermometer, pressure spring thermometer, static accuracy and response of thermometry.

UNIT-II **(10 Lectures)**

Thermoelectricity industrial thermocouples, thermocouple wires, thermocouple wells and response of thermocouples, thermal coefficient of resistance, industrial resistance thermometer bulbs and circuits radiation receiving elements, photoelectric and pyrometers.

UNIT-III (10 Lectures)

Composition analysis, spectroscopic analysis by absorption, emission, mass and color measurement spectrometers, gas analysis by thermal conductivity, analysis of moisture, gas chromatography, refractometer.

UNIT-IV (10 Lectures)

Pressure vacuum and head: liquid column manometers, measuring elements for gauge pressure and vacuum, indicating elements for pressure gauges, measurement of absolute pressure, measuring pressure in corrosive liquids, static accuracy and response of pressure gauges.

UNIT-V (10 Lectures)

Head, density and specific gravity, direct measurement of liquid level, pressure measurement in open vessels, level measurements in pressure vessels, measurement of interface level, density measurement, and level of dry materials.

Head flow meters, area flow meters, open channel meters, viscosity meters, quantity meters, flow of dry materials, viscosity measurements.

Recording instruments, indicating and signaling instruments, transmission of instrument readings, control center, instrumentation diagram, process analysis.

TEXT BOOK:

1. Eckman D.P. *"Industrial Instrumentation"*, CBS Publishers & Distributors, New Delhi, Reprint-2004.

REFERENCE:

1. Patranabis D, *"Principles of Process Control"*, 2nd Edition, Tata McGraw Hill, 2000.