16PL303

PROCESS INSTRUMENTATION

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P	WA/RA	SSH/HSH	CS	SA	S	BS
45	15	-	25	48	-	5	5	5

Course Description and Objectives:

The course provides insight into instruments that are used to measure physical properties in chemical process industries. The objective of this course is to familiarize student with the working principles of standard measurement devices used in engineering applications.

Course Outcomes:

The Student will be able to:

- discuss principles involved in the measurement and control of industrial processes.
- understand instruments and devices used for designing process control systems.

SKILLS:

1. *Temperature measurement with electrical systems.*
2. *Flow measurement with different devices.*
3. *Select a suitable measurement device for a given application.*

UNIT - 1

QUALITIES OF MEASUREMENT : Elements of Instruments, Static and dynamic characteristics, Response of first order instruments.

TEMPERATURE MEASUREMENTS : Expansion thermometer- Thermoelectric temperature measurements.

UNIT - 2

TEMPERATURE MEASUREMENT : Resistance and radiation, Thermal coefficients of resistance, Industrial resistance thermometer bulbs and circuits, Radiation, Photoelectric and optical pyrometers.

COMPOSITION ANALYSIS : Spectroscopic analysis, Chromatography (GC, HPLC, GCMS/LCMS), Color measurement spectrometers.

UNIT - 3

MEASUREMENT OF PRESSURE AND VACUUM : Liquid column manometers, Gauge pressure and vacuum measurement, Indicating elements for pressure gauges, Measurement of absolute pressure, Corrosive liquids, Static accuracy and response of pressure gauges.

UNIT - 4

MEASUREMENT OF HEAD AND LEVEL : Head, Density and specific gravity measurement, Direct measurement of liquid level, Pressure measurement in open vessels measurement of interface level, Density measurement.

UNIT- 5

FLOW METERING : Head Flow and area flow meters, Open channel meters, Viscosity measurements,

Quantity meters, Flow of dry materials. Recording, Indicating and signaling Instruments. PI Diagrams, Control center.

TEXT BOOKS :

1. Donald P. Eckman, “Industrial Instrumentation”, 1st edition, Wiley Eastern, 2004.

2. Patranabis, “Principles of Industrial Instrumentation”, 2nd edition, Tata McGraw-Hill, 2007.

REFERENCE BOOKS :

1. D.M.Considine, “Hand Book of Instrumentation”, 2nd edition, McGraw-Hill, 1957.

2. Norman Anderson, “Instrumentation for Process Measurement and Control”, 3rd edition, CRC Press, 1997.

ACTIVITIES:

- *Calibration of spectro photometer.*
- *Measurement of flow rate in open channels.*
- *Calibration of head and flow meters.*