

# PCEI4305 **INSTRUMENTATION DEVICES AND SYSTEMS–II**

(3-0-0)

## **Module –1 (7 Hrs)**

Acceleration Measurement:

Piezoelectric transducers: basic principle, equivalent circuit, frequency response, charge amplifier; acceleration measurement: basic principle and frequency response; piezoelectric accelerometer.

(Bentley: Section 8.7, Ghosh: Section 9.1)

Miscellaneous Measurements: (6 Hrs)

Level measurements using floats, hydrostatic pressure gage and capacitive type; principles of ultrasonic and gamma ray type level indicators. Humidity sensor: capacitive type. pH and liquid conductivity measurements: basic principles.

(Ghosh: Sections 12.1, 12.3.3, 12.4, 13.3 and 13.5; Bentley: Section 8.9)

## **Module-2:**

Optical sensing: (7 Hrs)

LED and photoresistors and photodiodes; Radiation pyrometer: Planck's law, Stefan Boltzmann's law, broad band and narrow band pyrometer; optical fiber and fiber optic sensing.

(Johnson: Chapter 6, Bentley: Sections 15.2, 15.3.2, 15.5, 15.6)

## **Module-3:**

Final Control Elements: (8 Hrs)

Pneumatic systems: Flapper nozzle amplifier and its characteristics, pneumatic actuators; elements of power electronic devices; Electrical actuators: solenoids, d.c and a.c. servomotors, principle of stepper motors, hydraulic actuators; Control valve characteristics.

(Johnson: chapter 7)

Programmable Logic Controllers: (8 Hrs)

Discrete state process control and its characteristics; input and output devices; Event sequence description with examples; Relay ladder logic and its construction; Programmable Logic Controllers (PLCs): functional description, PLC software functions; programming examples.

(Johnson: Chapter 8)

## **Text Books:**

1. Principles of Measurement Systems- J.P. Bentley (3/e), Pearson Education, N Delhi,
2. Introduction to Measurement and Instrumentation- A.K. Ghosh(3/e), PHI Learning.
3. Process Control Instrumentation Technology- C.D. Johnson (8/e), PHI Learning,

## **Reference Books:**

1. Transducers and Instrumentation- D.V.S. Murthy (2/e), PHI Learning, New Delhi, 2009.
2. Measurement Systems Application and Design- E.O. Doebelin (4/e), McGraw-Hill, International, NY.
3. Modern Control Technology Components and Systems- C.T. Kilian (3/e), Clengage Learning, New Delhi, 2006.