Sensors and Transducers Code : El401 Contacts : 3L+1T Credits : 4

Module I

Definition, principles of sensing and transduction, classification [1]

Mechanical and Electromechanical sensors

Resistive (potentiometric) type: Forms, materials, resolution, accuracy, sensitivity [2]
Strain Gauges: theory, types, materials, design consideration, sensitivity, gauge factor, variation with temperature, adhesives, rosettes, applications force, velocity and torque measurements [3]
Inductive sensors: common types- reluctance change type, mutual inductance change type, transformer action type, - brief discussion with respect to materials, construction and input output variables, Ferromagnetic plunger type-short analysis; proximity measurement [3]
LVDT: Construction, materials, output-input relationship, I/O curve, discussion [2]

Module II

Capacitive sensors: Variable distance- parallel plate type, Variable area- parallel plate, serrated plate/ teeth type and cylindrical type, variable dielectric constant type: calculation of sensitivities; proximity measurement [3] Stretched Diaphragm type: microphones, response characteristics [1]

Piezoelectric elements: piezoelectric effects, charge and voltage coefficients, crystal model, materials, natural and synthetic types – their comparison, force and stress sensing, piezoelectric accelerometer [3]

Tachometers – Stroboscopes, Encoders, seismic accelerometer, Measurement of vibration. [3]

Module III

Industrial weighing systems : Link–lever mechanism, Load cells – pneumatic, piezoelectric, elastic and magneto-elastic types - their mounting, pressductor, different designs of weighing systems, conveyors type, weighfeeder type. [5]

Thermal sensors: [6] Resistance change type: RTD - materials, construction, types, working principle Thermister - materials, construction, types, working principle Thermoemf sensors: Thermocouple - types, working principle Thermopile - types, working principle

Module IV

Magnetic sensors: Sensors based on Villari effect for assessment of force, torque, rpm meters, proximity measurement Hall effect and Hall drive, performance characteristics [4]

Geiger counters, Scintillation detectors [2]

Introduction to Smart sensors [2]

Books:

D Patranabis, Sensors and Transducers, PHI, 2nd ed.
 E. A. Doebelin, Measurement Systems: Application and Design Mc Graw Hill, New York

3. H. K. P. Neubert, Instrument Transducers, Oxford University Press, London and Calcutta