

**INSTRUMENTATION PHYSICS.**

**UNIT – I : Instrument Characteristics.**

Static Characteristics – range and span, accuracy, errors and corrections, calibration, hysteresis dead zone, drift, sensitivity, threshold and resolution, precision, repeatability and reproducibility, linearity.

Dynamic Characteristics – speed of response and measuring lag, fidelity and dynamic error. Overshoot, dead time and dead zone, frequency response, standard test inputs. O.I. & II order systems.

**UNIT – II : Sensors & Transducers.**

Mechanical detector – transducer elements – elastic elements, mass sensing elements, thermal detectors. Electrical transducers – variable resistance transducers – linear and angular motion potentiometers, resistance thermometers and thermistors, resistance strain gauges. Thermo-electric transducers, variable inductance transducers, self generating units, linear variable differential transformer, capacitive transducers, piezoelectric transducers, photo-electric transducers – photoemissive cell, photoconductive cell, photovoltaic cell.

**UNIT – III : Signal Conditioning.**

Amplification – Mechanical amplifiers – simple and compound levers. Fluid amplifiers, hydraulic & pneumatic amplifiers, simple and compound gears. Optical amplifiers, electrical and electronic amplifiers – ac & dc amplifiers, differential and operational amplifier, charge amplifier. Modulation techniques amplitude modulation, frequency modulation, signal filtering, signal transmission – mechanical transmission, hydraulic transmission – magnetic transmission – electrical transmission.

**UNIT – IV : Display Units.**

Analog and digital displays, mechanical pointers, analog scale pointer design – pointer length, parallax error elimination, digital read out devices, data recording mechanical and electromechanical recorders, ultraviolet recorders, servorecorders, xy recorders, CRO.

**UNIT – V : Measurements.**

Angular measurement – Sine bar & Angle gauges, Area measurement – trapezoidal rule, polar polarimeter, pressure measurement – Single column manometer, U-tube differential manometer – Flow measurement – orifice flow meter, cup and vane anemometers. Temperature measurement – radiation and optical pyrometers. Strain measurement – Signal conditioning strain gauge circuits – ballistic circuit voltage – sensitive potentiometer circuit, Wheat stone bridge circuit. Speed, acceleration and frequency measurements – mechanical tachometer – centrifugal force tachometers, stroboscope, piezoelectric accelerometer force, torque, shaft power measurements – scales and balances, optical torsion meter, mechanical brakes.

**Text Book:**

D.S.Kumar, Mechanical Measurements and Control Metropolitan Book Co., II Edition.