

**OBJECTIVES:**

- To understand the concepts of measurement technology.
- To learn the various sensors used to measure various physical parameters.
- To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

**UNIT I INTRODUCTION**

9

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

**UNIT II MOTION, PROXIMITY AND RANGING SENSORS**

9

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

**UNIT III FORCE, MAGNETIC AND HEADING SENSORS**

9

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclonometers.

**UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS**

9

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple, Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

**UNIT V SIGNAL CONDITIONING and DAQ SYSTEMS**

9

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi channel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

**TOTAL : 45 PERIODS****OUTCOMES:**

The students will be able to

**CO1.** Expertise in various calibration techniques and signal types for sensors.

**CO2.** Apply the various sensors in the Automotive and Mechatronics applications

**CO3.** Study the basic principles of various smart sensors.

**CO4.** Implement the DAQ systems with different sensors for real time applications

**TEXT BOOKS:**

1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2009.
2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12<sup>th</sup> edition, Dhanpat Rai & Co, New Delhi, 2013.

**REFERENCES**

1. Patranabis D, "Sensors and Transducers", 2<sup>nd</sup> Edition, PHI, New Delhi, 2010.
2. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications, 1999.
3. Richard Zurawski, "Industrial Communication Technology Handbook" 2<sup>nd</sup> edition, CRC Press, 2015.