

5th Semester	REE5D006	Sensors and Transducers	L-T-P 3-0-0	3 Credits
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Sensors and Transducers

Module-I (9 Hours)

Elements of a general measurement system: Static Characteristics: systematic characteristics, statistical characteristics, calibration; Dynamic characteristics of measurement systems: transfer functions of typical sensing elements, step and frequency response of first and second order elements, and dynamic error in measurement systems.

Module-II (8 Hours)

Sensing elements: Resistive sensing elements: potentiometers, Resistance Temperature Detector (RTD), thermistors, strain gages. Capacitive sensing elements: variable separation, area and dielectric; Inductive sensing elements: variable reluctance and LVDT displacement sensors; Electromagnetic sensing elements: velocity sensors.

Module-III (8 Hours)

Thermoelectric sensing elements: laws, thermocouple characteristics, installation problems, cold junction compensation. IC temperature sensor Elastic sensing elements: Bourdon tube, bellows, and diaphragms for pressure sensing, force and torque measurement.

Module-IV (9 Hours)

Signal Conditioning Elements: Deflection bridges: design of resistive and reactive bridges, push-pull configuration for improvement of linearity and sensitivity. Amplifiers: Operational amplifiers-ideal and non-ideal performances, inverting, non-inverting and differential amplifiers, instrumentation amplifier, filters. A.C. carrier systems, phase sensitive demodulators and its applications in instrumentation.

Books:

- [1] J.P. Bentley, "Principles of Measurement Systems", Pearson Education, New Delhi, 3rd Edition, 2007.
- [2] A.K. Ghosh, "Introduction to Measurement and Instrumentation", PHI, 3rd Edition, 2009.
- [3] E.O. Doebelin, "Measurement Systems Application and Design", McGraw-Hill, International, 4th Edition.
- [4] J.W. Dally, W.F. Riley and K.G. McConnel, "Instrumentation for Engineering Measurements", John Wiley, NY, 2nd Edition 2003.
- [5] T.R. Padmanabhan, "Industrial Instrumentation", Springer, London, 2000.

Digital Learning Resources:

Course Name: Industrial Instrumentation
 Course Link: <https://nptel.ac.in/courses/108/105/108105064/>
 Course Instructor: Prof. A Barua, IIT Kharagpur