EE-423 (Transducers in Instrumentation)

L-T- P: 3-0-0

Unit I: Evolution and Trends in Instrumentation

Evolution: Kelvinian Concept of Measurement, Instrumentation - Many Facets, Sensors – Techniques and Technology. Signal Conditioning & Signal Processing, Signal Transmission, End Devices and Interfacing.

The Trends: Taking up new challenges, Smart and Intelligent Sensors, Introduction to Image Based Instrumentation.

Unit II: Classification of Instrumentation Transducer

Analog/digital, Active/passive, Force balance, Variable Resistance Transducers, Potentiometers, Strain Gauges, Resistance Thermometers, Thermistors, Hotwire Anemometers, Ac and Dc Bridges and Half bridges.

Unit III: Concepts based on Natural Human Reasoning

Fuzzy Logic Based Instrumentation, Al and Expert Systems based Instrumentation.

Concepts based on Statistical Analysis: Estimation and Correlation Techniques, Concept of Conventional Filtering and Estimators.

Unit IV: Electrical Sensors in Instrumentation

Active Sensors-Thermocouple, Piezoelectric Sensors, pH Sensors.

Passive Sensors: Inductance Sensors, Capacitance Sensors.

Optical Sensors: Classification based on signal acquisition techniques and coherency of optical sources, Sensors based on Modulation of Optical Signal, Optical speed Sensor, Optical Shaft Encoder. Laser Based Sensors, Evolution of Microsensors and Micro-Electro-Mechanical-Systems(MEMS).

Unit V: Robotic Instrumentation

Robotic Preliminaries, Classification of Robots, Functional Components of a Robot, Robotic Sensing, Robotic Measurement & Instrumentation.

Recent Developments in Instrumentation & Measurements, Computer Aided Measurements and Data Acquisition System.

Case Studies and introduction to virtual instrumentation

Text Books:

1. Herman K p Neubert, “Instrument Transducers-An introduction to their performance and design”, Oxford University Press 2nd Edition, 12th Impression 2011.
2. M K Ghosh, S Sen & S Mukhopadhyay, “Measurement & Instrumentation-Trends & Applications”, Ane Books Pvt. Ltd. (2009 Reprint)

Reference Books:

1. Doeblin, E.O.”Measurement Systems: Application and Design, Mc Graw Hill International.
2. Patranabis, D – Sensors and Transducers, Wheeler Pub., New Delhi.
3. B C Nakra & K K Chaudhary, “Instrumentation, Mesurement and Analysis” Tata Mc Graw Hill. Fourt Reprint 2005.
4. Murthy, D.V.S., Transducers and Instrumentation, PHI, New Delhi.
5. Alexander D Khazan, “Transducers and their elements – Design and application”, PTR Prentice Hall, 1994.