3/4 B.Tech. FIFTH SEMESTER FREE ELECTIVE

FE TRANSDUCERS AND SIGNAL CONDITIONING Credits:4

Lecture: 4 periods/week **Internal assessment :30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Course Objectives:

- To understand the basic concepts of measurement systems and classification of various Transducers
- Expose to various sensors for Measuring Different Electrical parameters
- To understand the working principle of various signal conditioning elements in the Measurement systems
- To know the principle of various Digital Transducers

Learning Outcomes:

At the end of this course, the Student will be able to

- Explain the Basic Measurement system and Transducers classification
- Differentiate the various sensors for Measuring Physical Parameters
- Apply knowledge of various Transducers for industrial applications.

UNIT-I

INTRODUCTION :Measurement systems, Basic electronic measuring system, Transduction principles, Classification of transducers, General transducers characteristics, Criteria for transducer selection.

UNIT-II

RESISTIVE TRANSDUCERS: Principles of operation, construction, theory, advantages and disadvantages, applications of Potentiometers, strain gauges, (metallic and semi-conductor type), Resistance Thermometer, Thermistors.

UNIT-III

INDUCTIVE TRANSDUCERS: Types of Inductive transducer, Principles of operation, construction, Advantages & disadvantages and applications. Various variable Inductive Transducers, LVDT (Linear variable differential transformer).

UNIT-IV

CAPACITIVE TRANSDUCERS: Types of capacitive transducer, Principles of operation, construction, theory, advantages and disadvantages and applications, of capacitive transducers based upon familiar equation of capacitance.

UNIT-V

ELASTIC TRANSDUCERS: Spring bellows, diaphragm, bourdon tube – their special features and application.

UNIT-VI

ACTIVE TRANSDUCERS: Principle of operation, construction, theory, advantages and disadvantages and applications of following transducers: Thermocouple, Piezo-electric transducer, Magneto-strictive transducer, Hall effect transducer, Photo-voltaic transducer and Electrochemical transducer.

UNIT-VII

DIGITAL TRANSDUCERS : Optical encoder, Shaft encoder. Feedback fundamentals, introduction to Inverse transducer.

UNIT-VIII

SIGNAL CONDITIONING: Concept of signal conditioning, Introduction to AC/DC Bridges. Op-amp circuits used in instrumentation, Instrumentation amplifiers, analogue-digital sampling, introduction to A/D and D/A conversion, signal filtering, averaging, correlation, Interference, grounding , and shielding.

Learning Outcomes

TEXT BOOKS :

1. Murty D V S, “Transducers & Instrumentation”, PHI, New Delhi (2000)
2. Sawhney A K, “Electrical and Electronics Measurements and Instrumentation”, Dhanpat Rai and Sons,New Delhi (2000).

REFERENCE BOOKS:

1. Kalsi H S, “Electronic Instrumentation “ Tata McGraw Hill, New Delhi, 4th Ed. (2001)
2. Patranabis D, “Sensors and Transducers”, PHI, New Delhi (2003).
3. Doebelin Ernest O, ”Measurement Systems: Application and Design”, Tata McGraw Hill Ltd., New Delhi