

Course Type	Course Code	Name of Course	L	T	P	Credit
DE	EED405	Instrumentation	3	0	0	9

### Course Objective

This course will give the basic concept of the modern instrumentation system along with its industrial applications. The course will also give clear ideas about working principles of modern sensors and transducers as well as its system level integration.

### Learning Outcomes

Upon successful completion of this course, students will:

- understand the basic concept of sensors and transducers,
- learn the mathematical modeling of different sensors and transducers,
- learn how transducers are integrated with other signal processing circuits.

Unit No.	Topics to be covered	Lecture Hours	Learning Outcome
1	Introduction, Performance Characteristics, Signal conditioning, Noise filtering, Instrumentation Amplifiers, Isolation Amplifiers, Programmable Gain Amplifiers.	8	Understand the basic characteristics of instruments and familiarisation of signal conditioning devices useful for modern instrumentation systems.
2	Variable Resistance, Inductance and Capacitance type Transducers, Piezoelectric, Optical, Magnetic and Thermal Transducers.	8	Understand the different Mechanical, Thermal, and Optical sensors.
3	Application of transducers for measurement of Displacement, Force, Strain, Pressure, Flow, Temperature and other nonelectrical quantities. Digital Displacement Transducers (incremental and absolute types).	10	Understand the applications of Mechanical, Thermal, and Optical sensors transducers.
4	Telemetry system: voltage, current, position, frequency and pulse Telemetry, components of Telemetry. Microprocessor and microcontroller based instrumentation. Data acquisition system. Fibre optic sensors, Nano instrumentation.	4	Understand the transmission system and its integration with sensors and transducers.
5	Introduction to the modern process control system. Process controllers: on-off, cascade, feed forward, ratio.	3	Familiarisation of transducers for process control applications.
6	Discontinuous mode controllers (Two-position, Multi-position, Floating) and Continuous mode controllers (Proportional, Integral, Derivative, and their composite modes: PI, PD, PID). Analog implementation of controllers.	9	Integration of transducers with controllers for process control applications.

### Text Books:

1. Measurement system: Application and design - E.O Doebelin, Tata Mcgraw Hill.
2. Process Control Instrumentation Technology - Curtis Johnson, Pearson.
3. Measurement and Instrumentation principles - Morris, Elsevier.

### Reference Books:

1. Transducers and Instrumentation - DVS Murty, Prentice Hall (India).