INSTRUMENTATION AND SENSOR TECHNOLOGIES OF CIVIL ENGINEERING APPLICATIONS

Course Code	19EC2801B	**Year**	IV	**Semester**	II
Course Category	Inter Disciplinary Elective-III	**Branch**	Common to All	**Course Type**	Theory
Credits	3	**L – T – P**	3 – 0 – 0	**Prerequisites**	Nil
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes		**Level**
After successful completion of the course, the student will be able to		
CO1	Summarize various performance characteristics of instruments and the quality of measurement.	L2
CO2	Interpret the type of transducer based on the transduction principles.	L2
CO3	Identify the relevant transducer for measurement of physical quantities.	L3
CO4	Discover the additional attributes in advanced sensors and their role in Civil Engineering.	L4

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3-High, 2: Medium, 1: Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	2	1										2
CO2	2	1	2	1										2
CO3	2	1	2	1										2
CO4	2	1	2	1										2

Syllabus

Unit No.	**Contents**	**Mapped COs**
I	**Introduction:** Definition of sensor/transducer-Block Diagram-elements of measurement system-classification of sensors/transducers-static characteristics-accuracy, precision, resolution, linearity, sensitivity, range, loading effect, threshold, dead time, dead zone, span. **Errors in measurement**: True value, static error, static correction, scale range and scale span, error calibration curve, readability, repeatability & reproducibility, drift and noise	CO1
II	**Resistive Transducers:** Potentiometers-Linear POT, Rotary POT, characteristics of POT. Thermistors- Construction and its Resistance- Temperature characteristics. Thermocouples- Construction and its Resistance-emf characteristics **Inductive Transducers**: Principle of change of self-inductance, Principle of change of mutual inductance, Linear variable differential transformer (LVDT), Rotary variable differential transformer (RVDT).	CO2, CO3

III	**Capacitive Transducers**: Introduction-Variable area type-variable air gap type- differential arrangement in capacitive transducers, variation of dielectric constant for measurement of liquid level, , variation of dielectric constant for measurement of displacement, advantages & disadvantages of Capacitive transducers . **Piezoelectric Transducers**: Measurement of Force, Modes of operation of Piezoelectric crystals, properties of Piezoelectric crystals, use of Piezoelectric Transducers.	CO2, CO3
IV	**Hall effect Transducers:** Hall effect element, Measurement of displacement, current and power. **Optical Transducers:** Vacuum photo emissive cell and its characteristics, semiconductor photo electric transducer- Photo conductive cell and its characteristics, photo diode and its characteristics, photo voltaic cell and its characteristics.	CO2, CO3
V	**Digital and Smart Sensors:** Introduction to digital encoding transducer- digital displacement transducers- shaft encoder-optical encoder, Introduction to Smart Sensors, Overview in Applications of sensors in Civil Engineering.	CO4

Learning Recourse(s)

Text Book(s)

1. A.K.Ghosh, "Introduction to Measurements & Instrumentation", IIIrded, PHI
2. A.K.Sawhney&PuneetSawhney, "A Course in MechnanicalMeasuremnets& Instrumentation",DhanapatRai& Co.
3. D.V.S.Murty, "Transducers & Instrumentation", PHI.

Reference Book(s)

1. Raman Pallas-Arney& John G.Webster, "Sensors & Signal Conditioning",2012.
2. D.Patranabis, "Sensors and Transducers" 2nd edition., PHI, 2013.
3. BC Nakra, KK Chaudhry "Instrumentation, Measurement and Analysis", 2nd Edition,TMH