

**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	--
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes

Upon 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)

Mapping of course outcomes with Program outcomes (CO/ PO/PSO Matrix)

Note: 1- Weak correlation 2-Medium correlation 3-Strong correlation

* - Average value indicates course correlation strength with mapped PO

COs	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
Average* (Rounded to nearest integer)	2	1	2	1										2

Syllabus

Unit No.	Contents	Mapped CO
I	<p>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.</p> <p>Errors in measurement: True value, static error, static correction, scale range and scale span, error calibration curve, readability, repeatability & reproducibility, drift and noise</p>	CO-1

II	<p>Resistive Transducers: Potentiometers-Linear POT, Rotary POT, characteristics of POT. Thermistors- Construction and its Resistance- Temperature characteristics.</p> <p>Thermocouples- Construction and its Resistance-emf characteristics</p> <p>Inductive Transducers: Principle of change of self inductance, Principle of change of mutual inductance, Linear variable differential transformer (LVDT), Rotary variable differential transformer (RVDT).</p>	CO-2, CO-3
III	<p>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 .</p> <p>Piezoelectric Transducers: Measurement of Force, Modes of operation of Piezoelectric crystals, properties of Piezoelectric crystals, use of Piezoelectric Transducers.</p>	CO-2, CO-3
IV	<p>Hall effect Transducers: Hall effect element, Measurement of displacement, current and power.</p> <p>Optical Transducers: Vacuum photo emissive cell and its characteristics, semi conductor photo electric transducer- Photo conductive cell and its characteristics, photo diode and its characteristics, photo voltaic cell and its characteristics.</p>	CO-2, CO-3
V	<p>Digital and Smart Sensors:</p> <p>Introduction to digital encoding transducer- digital displacement transducers- shaft encoder-optical encoder, Introduction to Smart Sensors, Overview in Applications of sensors in Civil Engineering.</p>	CO-4

Learning Resources

Text Books

1. A.K.Ghosh, "Introduction to Measurements & Instrumentation", IIIrd ed, PHI
2. A.K.Sawhney & Puneet Sawhney, "A Course in Mechanical Measurements & Instrumentation", Dhanapat Rai & Co.
3. D.V.S.Murty, "Transducers & Instrumentation", PHI.

Reference Books

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