SENSORS AND INSTRUMENTATION (Professional Elective-II)

Course code	23ME4601D	Year	III	Semester	II
Course category	Professional Elective-II	Branch	ME	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: At the end of the course, student will be able to

CO	Statement	Skill	Blooms Level	Units
CO1	Recognize with various calibration techniques and signal types for sensors.	Understand, Communication	L2	1
CO2	Describe the working principle and characteristics of Motion, Proximity, Ranging, force, magnetic, heading, pressure and temperature, smart and other sensors and transducers.	Apply, Communication	L2	2,3,4
CO3	Apply various sensors and transducers in various applications	Apply, Communication	L3	2,3,4
CO4	Analyse the signals from different sensors using Data acquisition systems	Analysis, Communication	L4	5

Contribution of Course outcomes towards the achievement of program outcomes & Strength of correlations (High :3, Medium:2, Low:1)													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1				3	3	3					2	2	2
CO2				3	3	3					2	2	2
CO3				3	3	3					2	2	2
CO4				3	3	3					2	2	2
CO5				3	3	3					2	2	2

UNIT	Contents	Mapped CO
I	**INTRODUCTION** Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.	CO1
II	**MOTION, PROXIMITY AND RANGING SENSORS** Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer – GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).	CO2 CO3
III	**FORCE, MAGNETIC AND HEADING SENSORS** Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors –	CO2 CO3

	Compass, Gyroscope, Inclinometers.	
IV	**OPTICAL, PRESSURE AND TEMPERATURE SENSORS** Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.	CO2 CO3
V	**SIGNAL CONDITIONING AND DAQ SYSTEMS** Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi-channel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.	CO4

TEXT BOOKS:

1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2009.
2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", Dhanpat Rai & Co, 12th edition New Delhi, 2013.

REFERENCES

1. C. Sujatha ... Dyer, S.A., Survey of Instrumentation and Measurement, John Wiley & Sons, Canada, 2001.
2. Hans Kurt Tönshoff (Editor), Ichiro, "Sensors in Manufacturing" Volume 1, Wiley-VCH April 2001.
3. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications, 1999.
4. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi, 2011.
5. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015.