

Course Title: Sensors & Industrial Instrumentation	CourseCode: 24MJEL4S
TotalContactHours: 60	No. of Credits: 04
Internal Assessment Marks: 20	Durationof SEE: 3 Hours
SemesterEndExamMarks: 80	

Course Outcomes (COs):

At the end of this course students will be able to:

1. Apply scientific principles for sensing various physical quantities.
2. Understand the operational details of sensors for measurements
3. Apply measurements techniques for instrumentation.

Unit	Description	Hours
1	Introduction to Electronics Measurement and Instrumentation: 1 2 3 4 Transducers and sensors- Accuracy and precisions, types of errors, statistical analysis, probability of errors, limiting errors, sensitivity, linearity, hysteresis, resolution, reproducibility, transfer function. Analog Signal Conditioning: Signal conditioning, Loading effects, Bridges for measurement techniques, Attenuators and Amplifiers, Passive filters, Op-amp based signal conditioning circuits, Inverting and Non-Inverting Amplifiers, Linearization, Differential amplifiers and Instrumentation amplifiers. Temperature Sensors: Resistance Vs Temperature characteristics for different materials, Thermistors, Thermocouples - thermoelectric effects for thermocouples,	14
2	Pressure, force, displacement and weight measurement: 5 6 7 Capacitive and inductive transducers, Displacement Sensor (LVDT), Strain Sensors – strain gauges, its principle, applications, types of strain gauges, Load cells, Piezo-electric sensors, Motion sensors. Flow measurement: Basic principle of flow meter, Differential pressure flow meters, Variable area flow meter, Volumetric flow meter, Hotwire anemometer, Magnetic and ultrasonic flow meter, Rota meter, Hall effect transducer working and measurement	16

	techniques. RF sensing: Basic principle of EM fields, Antenna, RFID, Near Field and Far Field Sensing, Radar and Navigation, EMI & EMC sensing	
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List of References:

1. Curtis D. Johnson, "Process Control Instrumentation Technology", Prentice Hall India.
2. D.V.S. Murty, "Transducers and Instrumentation", Prentice Hall India.
3. Helfrick Albert D. and Cooper W. D., "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall India.
4. Kalsi H. S. "Electronic Instrumentation", Tata McGraw-Hill Education.
5. Sawhney A. K. "A Course In Electrical and Electronics Measurements and Instrumentation", Dhan Patrai & Sons, 11th Ed., 1999.
6. Bell David A. "Electronic Instrumentation and Measurements", PHI / Pearson Education.
7. Mathew Sadiku, "Elements of Electromagnetics", PHI.