

<b>5<sup>th</sup> Semester</b>	<b>REI5D001</b>	<b>Sensors and Actuators</b>	<b>L-T-P 3-0-0</b>	<b>3 CREDITS</b>
------------------------------------	-----------------	------------------------------	------------------------	----------------------

## Sensors and Actuators

### **Module I: (12 Hours)**

#### **Introduction & Classification**

Sensors overviews, Principles of operation based on variable resistance, variable inductance, variable reluctance and variable capacitance methods, Hall effect device.

Digital Displacement Sensor, Force, Torque, Tactile and Pressure Sensors: Working principles based on contact closure, magnetic, Piezoelectric, Photoelectric, capacitive and ultrasonic methods.

Manometer: elastic elements, Electrical and Piezoelectric pressure transducers.

### **Module II: (07 Hours)**

#### **Flow Sensors**

Basics of flow measurement; differential pressure flow meters- Pitot tube, Orifice plate, Venturi tube; Rota meter, turbine type flow meter, electromagnetic flow meter, Anemometer, Doppler shift flow meter. Max Machinery flow meter, Paddlewheel Sensors, Positive Displacement Flow Meters.

### **Module III: (06 Hours)**

#### **Smart Sensor**

Methods of internal compensation, information coding, integrated sensor principles, present trends.

Sensors in Robotics: Potentiometers, Synchros and Resolvers, Optical encoders, Tactile and Proximity sensors, Non-contact ranging sensors

### **Module IV: (07 Hours)**

#### **Actuators**

Pneumatic Hydraulic system: Control valves, cylinder, rotary actuators, Mechanical actuating system: Types of Motion, Kinematics chains, Cams, Gear trains, Belts and chain drives, Electrical actuating systems: Solid-state switches, Solenoids, D.C. motors, AC motors, Stepper motors, Piezoelectric actuator, micro-actuators.

**Books:**

- [1] Sensors and transducers, Patranabis.D, 2003,PHI.
- [2] Sensors And Actuators: Control System Instrumentation by Clarence W. De Silva  
Publisher
- [3] Shape memory actuators, Manfred Kohl, first edition, Springer
- [4] Transducers and Instrumentation, Murthy.D.V.S, 2001, Prentice Hall ofIndia
- [5] Measurement Systems Application and Design- E.O. Doebelin (4/e), McGraw-Hill,  
International, NY.
- [6] Industrial instrumentation and control, S.K.singh, 3rd Edition, TMH

**Digital Learning Resources:**

Course Name: Sensors & Actuators  
Course Link: [https://nptel.ac.in/content/syllabus\\_pdf/108108147.pdf](https://nptel.ac.in/content/syllabus_pdf/108108147.pdf)  
Course Instructor: Prof. Hardik J Pandya , IISC Bangalore