

Instrumentation Physics Phy 338

	Topic
<p>Chapter 1</p>	<p>Measurements instrumentation 1-electronic instrument 2-instrumentation functions 3- basic elements of instrumentation</p> <p>performance characteristics static characteristics 1-Accuracy 2-Resolution 3-Precision 4-Expected value 5-Error 6-Sensitivity 7-Error in measurements 8-types of static errors 9-dynamic characteristics 10-limited error 11- instrument application guide</p>
<p>chapter 2</p>	<p>Displacement Measurement, Linear and Angular 1-Resistive Displacement Sensors 2-Precision Potentiometers, Measurement Techniques, Costs and Sources, Evaluation. 3-Inductive Displacement Sensors 4-Linear and Rotary Variable-Reluctance Transducer, Linear Variable 5-Inductor, Linear Variable-Differential Transformer (LVDT), Rotary 6-Variable-Differential Transformer, Eddy Current, Shielding and Sensitivity of Inductive Sensors to Electromagnetic . Interference.</p>
<p>chapter 3</p>	<p>Capacitive Sensors—Displacement 1-Capacitive Displacement Sensors Differential Capacitive Sensors Integrated Circuit Smart Capacitive Position</p>

	<p>Sensors • Capacitive Pressure Sensors, Capacitive Accelerometers and Force Transducers Capacitive Liquid Level Measurement Capacitive Humidity and Moisture Sensors, Signal Processing</p>
chapter 4	<p>Proximity Sensing for Robotics</p> <p>1-Proximity Definition 2-Typical Sensor Characteristics 3-Technologies for Proximity Sensing 4-Electro-Optical Sensors • Capacitive Sensors • Ultrasonic Sensors • Magnetic Sensors Optical Encoder Displacement Sensors 1-Encoder Signals and Processing Circuitry• 2- Encoding Principles, Components and Technology</p>
chapter 5	<p>Distance</p> <p>1-Basic Distinctions Between Range Measurement Techniques 2-Contact or Noncontact • Active or Passive • Time-of-Flight, Triangulation, or Field Based • Form of Energy • Coherent or Noncoherent Detection • Ranging, Range Imaging, or Position Tracking 4- Performance Limits of Ranging Systems 5- Range Accuracy • Depth of Field • Maximum Range • Lateral 6- Motion Tracking Systems</p>
chapter 6	<p>Position, Location, Altitude Measurement</p> <p>1 -Altitude Measurement 2- Ground-Based Height Estimation • Onboard Derived Height Estimation • Estimation of Vertical Position with the Global Positioning System (GPS) • Special Topics 3- Attitude Measurement Attitude Sensors for Ships, Aircraft, and Crane Lifters • Attitude Sensors for Spacecraft Applications • Automatic On-Line Attitude Measurement for Ships and Crane Lifters • Aircraft</p>
chapter 7	<p>Level Measurements 1-Time-of-Flight Measurements Basic Principle • Ultrasonic • Microwaves • Laser/Light •</p>

	2- Commonly Used Evaluation Methods - Electrical Properties • Radiation Attenuation 3
chapter 8	Temperature and Humidity Measurement 1- The thermoelectric effect 2- Resistance change 3- Sensitivity of semiconductor device 4- Radiative heat emission 5- Thermography 6- Thermal expansion 7- Resonant frequency change 8- Sensitivity of fiber optic devices 9-Acoustic thermometry 10- Colour change 11- Change of state of material.

Reference:

1-Handbook of Modern Sensors Physics, Designs, and Applications

Authors: **Fraden**, Jacob

2- NPTEL – Mechanical – Mechatronics and Manufacturing Automation

Lecture note : Module 2: Sensors and signal processing