

**BHUBANANANDA ORISSA SCHOOL OF ENGINEERING, CUTTACK**

**Lesson Plan of Industrial Measurement and Instrumentation-I**

**By**

**SidharthSekharMallick, Lecturer AE&I**

*(Summer-2022)*

## VISION & MISSION OF APPLIED ELECTRONICS & INSTRUMENTATION ENGINEERING DEPARTMENT

### **VISION OF THE DEPARTMENT:-**

To produce efficient professional in applied electronics & instrumentation engineering and other allied area's with update technical knowledge to meet the challenges of society in relevant sector.

### **MISSION OF THE DEPARTMENT:-**

- To provide the student competent in applied electronics and instrumentation engineering with societal, environmental and human values through quality education, training.
- Provide knowledge of basic science, applied mathematics, instrumentation technology and communicative skills to identify and solve problems related to Applied Electronics and Instrumentation engineering.
- To enable the students to acquire various parameter measurement and automatic control technology used for industrial automation and inculcate quality of leadership, mentorship & teamwork in collaboration with parents, alumni & industry.

### **PROGRAMME EDUCATIONAL OBJECTIVES:**

- To provide students with a solid foundation in basic science, electrical, electronics, instrumentation and interdisciplinary subjects that is necessary to excel in professional career, entrepreneur in future and/or higher education.
- To prepare students to meet the needs and face the challenges of real life as well as industry automation and digitalization in terms of technical, economic and social feasibility.
- To inculcate professionalism, communication skills, attitudes, team work and to adapt to the current trends by engaging in lifelong learning.
- To utilize the technology in domestic, medical, industry and community for proper utilization of instrument for measurement & control.

<b>Discipline:</b> Applied Electronics & Instrumentation Engineering.	<b>Semester :</b> 3 <sup>rd</sup>	<b>Name of the teaching faculty:</b> Sidharth Sekhar Mallick
<b>Subject:</b> Industrial Measurement & Instrumentation-I	<b>No. of Days/per week class allotted:</b> 05 periods/per week (TUE,WED, SAT:- 1 Period each & FRI:- 02 Period)	<b>Semester From Date:-</b> 10-03-2022 <b>To Date:-</b> 10-06-2022 <b>No. of weeks:</b> 14 weeks
<b>Week</b>	<b>Class Day</b>	<b>Theory Topics</b>
1 <sup>st</sup>	11/03/2022	Introduction, syllabus discussion. <b>Unit-1 MEASUREMENT OF TEMPERATURE</b> 1.1 Classify methods of temperature measurements 1.2 Explain measurement of temperature by non-electrical methods. A. Liquid expansion type B. Solid expansion type. , Continuing.. C. Gas & Vapour expansion type.
	12/03/2022	
2 <sup>nd</sup>	15/03/2022	1.3 Explain measurement of temperature by electrical methods of measurement. A. Resistance thermometer i. State advantage of resistance thermometers are other types. ii. Describe the method of measurement of change in resistance by null balance bridge method. iii. Compensation of lead resistance by 3-wire &4-wire method.
	16/03/2022	
3 <sup>rd</sup>	22/03/2022	B. Thermocouples. i. Explain principle of thermoelectricity (See back, Peltier, Thompson effects). Continuing...
	23/03/2022	ii. Classify thermocouples materials. iii. Describe the function of thermocouple extension wires.
	25/03/2022	iv. Describe the methods of measurement of output of thermocouples state the types of thermocouples insulation materials & their function.
	25/03/2022	v. State the advantages &disadvantages of thermocouples types

			thermometer.
	26/03/2022		vi. Explain the cold junction compensation of thermocouple.
4 <sup>th</sup>	29/03/2022		C. Thermistors. i. Explain the basic principle & characteristics of thermistors.
	30/03/2022		ii. State the method of temperature measurement by thermistors & their uses. D. Pyrometers. i. Explain the principle & operation of radiation & optical pyrometer with suitable diagram.
	02/04/2022		E. Describe the function & use of temperature switch.
			<b>Unit-2 MEASUREMENT OF PRESSURE</b>
5 <sup>th</sup>	05/04/2022		2.1 Classify methods of pressure measurement. 2.2 Explain the working principle & use of mechanical methods of measurements of pressure by: i. manometers (U-tube, Well Type, Inclined type), Continuing... ii. Elastic type pressure gauge (Bourdon tube, Diaphragm, Bellows) iii. Bell gauge
	06/04/2022		
	08/04/2022		2.3 Explain the working principles & use of electrical methods of measurement of pressure by : i. Strain gauge pressure transducer ii. Capacitive pressure transducer, Continuing... iii. Reluctance pressure transducer iv. Piezoelectric pressure transducer
	08/04/2022		
	09/04/2022		2.4 Describe the operation and Explain the working principle of vacuum gauge i. Thermal conductivity Gauge ii. McLeod gauge, Continuing... iii. Hot filament ionization vacuum gauge
6 <sup>th</sup>	12/04/2022		
	13/04/2022		

	16/04/2022	2.5 Explain the working principle of mechanical & pneumatic pressure transmitter, Pressure Switch (Two wire and four wire type of transmitter) and State their uses.
7 <sup>th</sup>	19/04/2022	<b>Revision on Chapter 1 &amp; 2</b>
	20/04/2022	
	22/04/2022	<b>Class Test-1</b>
	22/04/2022	<b>Unit-3 MEASUREMENT OF FLOW AND LEVEL</b>
	22/04/2022	3.1 Classify flow meters and explain the principle of operation with diagram.
	23/04/2022	3.2 Variable head type flow meter: Explain the principle of operation, advantages & disadvantages of i. Orifice plate, ii. Venturi tube, Continuing...
	26/04/2022	iii. Nozzles, iv. Dall tube, v. Elbow Taps
8 <sup>th</sup>	27/04/2022	3.3 Explain variable area flow meter (Rota meter), Cylinder & Piston type & their uses.
	29/04/2022	iii. Explain the construction and use of inductive, resistive level gauge.
	30/04/2022	3.4 Explain Non-hydraulic meter and State their industrial uses. i. Magnetic flow meter ii. Ultrasonic flow meter
	29/04/2022	3.5 Describe the construction and explain working principle of thermal flow meter.
	04/05/2022	3.6 Describe the construction and explain principle of Quantity flow meter i. Positive displacement type ii. Reciprocating piston type
9 <sup>th</sup>	06/05/2022	3.7 Level Measurement i. Classify level indication ii. Explain the working of sight glass, float type of indicator and displacement level detector. Continuing...
	06/05/2022	iv. Explain the working of capacitive level detector and radiation level detector.
	07/05/2022	v. State and explain the function of different types of level switches.
	10/05/2022	<b>Internal assessment</b>
	10/05/2022	<b>Unit -4 MEASUREMENT OF FORCE, TORQUE &amp; SHAFT POWER</b>
10 <sup>th</sup>	10/05/2022	4.1 Define force, torque and shaft power. 4.2 Explain basic method of measurement of force.

	11/05/2022	4.3 State & Explain equal and non-equal arm balance.
	13/05/2022	4.4 Explain multiple level systems of force measurement.
	13/05/2022	4.5 Explain Hydraulic and Pneumatic load cell.
	14/05/2022	4.6 Explain methods of measurement of torque using strain sensor and magnetostriuctive torque- transducer.
11 <sup>th</sup>	17/05/2022	4.7 Explain measurement of shaft power using rope break and prony brake.
	18/05/2022	<b>Revision on chapter-3 &amp;4</b>
	20/05/2022	<b>Class Test-2</b>
	20/05/2022	<b>Unit -5- TELEMETRY &amp; VARIOUS CONVERTERS</b>
	21/05/2022	5.1 Define telemetry.
	21/05/2022	5.2 General telemetry system.
12 <sup>th</sup>	24/05/2022	5.3 Types of telemetry system.
	25/05/2022	5.4 Problems in telemetry system.
	27/05/2022	5.5 Pressure to current converter.
	27/05/2022	5.6 Pressure to voltage converter.
	28/05/2022	<b>Unit -6 Aquastic measurement -:</b>
		6.1 define aquastic pressure.
13 <sup>th</sup>	31/05/2022	6.2 Explain characteristic of sound pressure level & power level.
	01/06/2022	6.3 explain the function of typical sound system such as microphone.
	03/06/2022	<b>Revision on chapter- 5 &amp; 6</b>
	03/06/2022	<b>Class Test-3</b>
	04/06/2022	Quiz test on chapter- 1,2 & 3 and important question discussion
14 <sup>th</sup>	07/06/2022	Quiz test on chapter- 4,5 &6 and important question discussion
	08/06/2022	Revision and important question discussion on unit-1 & 2
	10/06/2022	Revision and important question discussion on unit-3 & 4
	10/06/2022	Revision and important question discussion on unit-5 & 6