

Course Name: Electronics Engineering Group

Course Code: ET/EJ/EX/EN/DE/IE/IS/IC/IU/ED/EI

Semester : Third

Subject Title: Industrial Measurements

Subject Code: 9041

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme						
TH	TU	PR	PAPER	HRS.	TEST	PR	OR	TW	TOTAL
03	--	02	03	80	20	-	25 #	25@	150

Rationale:

Reliable Measurements of various process quantities has been important for trade and commerce for Industrial activities.

Modern Engineering practices require adequately precise and fast measurement. This subject deals with measurement principles of process parameters like pressure, flow, level, temperature, displacement, humidity etc. covering nearly the entire gamut of Industrial Measurement.

Transducers are used for Measurement of parameters. Their specifications, limitations and applications, along with their static and dynamic behavior is important for studying this subject.

The prerequisite knowledge of these topics is essential for understanding process Instrumentation.

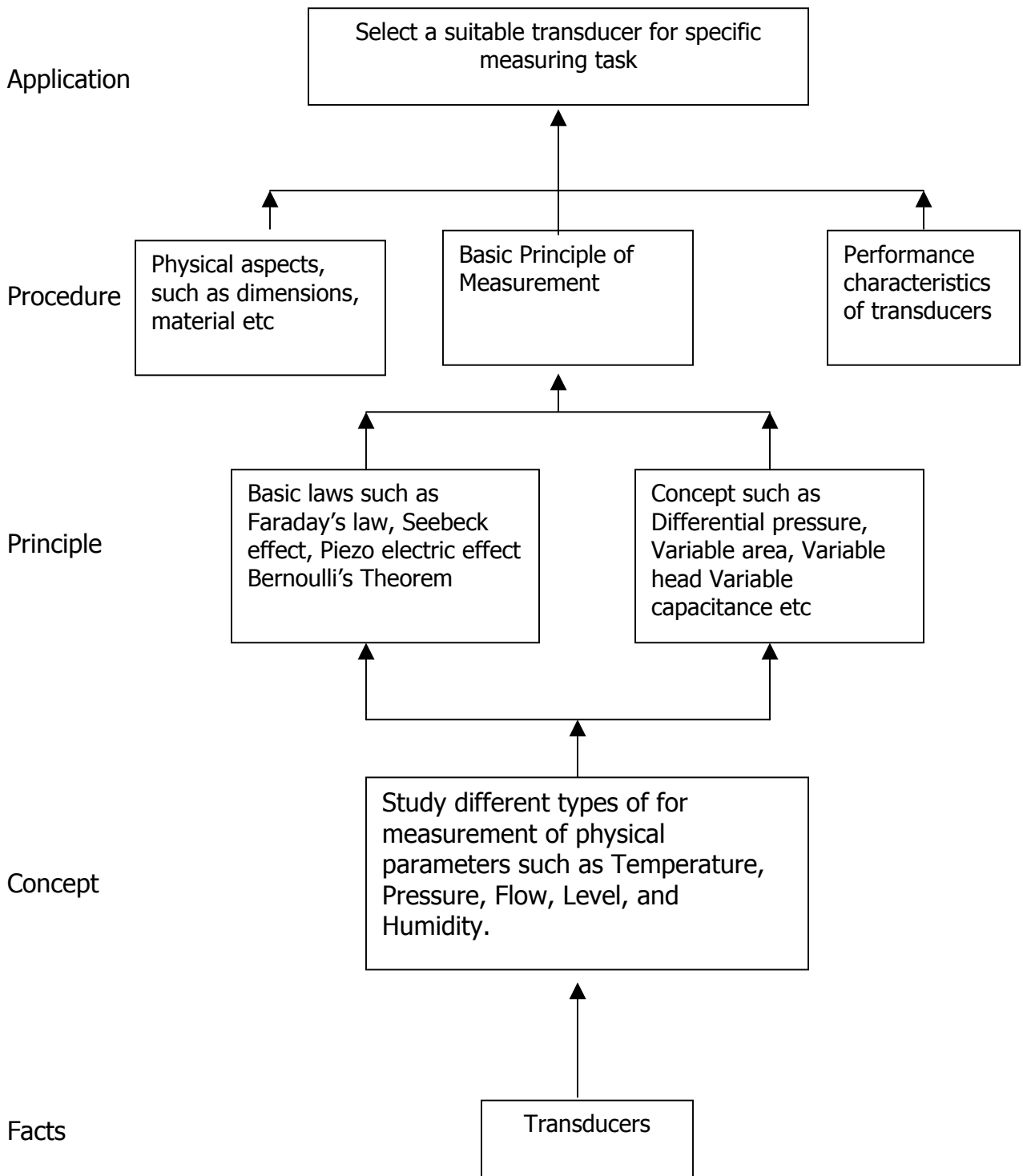
With this the student will be able to develop the supervisory skill and will be able to work as technician in Industries.

Objectives:

Student will be able to:

1. Select the most suitable transducer based on its performance characteristics, for specific measuring tasks
2. Define the physical quantities with proper units to ensure precise technical communication about the results of Measurement and perform calculations.
3. Use correct units for given Measurement.
4. Compare different types of transducer on their performance characteristics and applications
5. Learn the operating principles of transducers for Measurement of pressure flow, level, temperature, displacement and humidity
6. Solve problems related to range accuracy dead time etc.

Learning Structure:



Content: Theory

Chapter	Name of the Topic	Hrs	Mks
01	Transducers 1.1 Definition 1.2 Classification 1.3 Selection Criteria 1.4 Types – Strain Gauge, LVDT, RVDT, Capacitive, Resistive, Piezoelectric – Principle of Working, Advantages, Disadvantages and Applications	04	04
02	Pressure Measurement 2.1 Absolute, Gauge, Atmospheric, Vacuum – definition, Concept and Units 2.2 Manometers – Inclined Tube, U-Tube, Well Type 2.3 Elastic Pressure Transducers – Bourdon Tube, Bellows, Diaphragm, Capsule 2.4 Electronic Pressure Transmitters for measurement of Gage Pressure, Absolute Pressure, Vacuum 2.5 Calibration of Pressure Instruments – Dead Weight Tester	08	16
3	Flow Measurement 3.1 Types of Flow – Laminar, Turbulent, Reynold's number (Overview only) 3.2 Principle of Working, Construction, Advantages & Disadvantages and Applications of 3.2.1 Head Type Flow Meters – Ventury, Orifice Plate, Pitot Tube 3.2.2 Variable Area Flowmeter 3.2.3 Electromagnetic Flowmeters 3.2.4 Vortex Type Flowmeters 3.2.5 Corioli's Mass Flow Meter 3.2.6 Positive Displacement Flowmeters	10	16
4	Level Measurement 4.1 Principle of Working, Construction, Advantages & Disadvantages and Applications of 4.1.1 Float Type Level gauges 4.1.2 Hydrostatic Type Level Instruments – Gauges and Transmitters 4.1.3 Ultrasonic Level Measurement 4.1.4 Radar Level Measurement	08	16

5	Temperature Measurement 5.1 Temperature Scales and their Conversion 5.2 Principle of Working, Construction, Advantages & Disadvantages and Applications of 5.2.1 Filled Systems – Liquid and Gas Filled thermometers 5.2.2 Bimetallic Thermometers 5.2.3 RTDs – PTC, NTC, Pt-100 (2-3-4 Wire systems) 5.2.4 Thermocouples – Seebeck & Peltier Effect, Law of Intermediate Metals and Temperatures, Types J,K,R,S,T based on materials 5.2.5 Pyrometers – Radiation and Infrared	10	16
6	Miscellaneous Measurements 5.1 Humidity – Absolute and Relative 5.1.1 Dry & Wet Bulb Thermometer – Psychometric Charts 5.1.2 Hair Hygrometer 5.1.3 Electronic Transducers 5.2 Speed 5.2.1 Tachogenerators – A.C. & D.C. 5.2.2 Non-Contact Type – Photoelectric, Magnetic Pick Up Type	08	12
Total		48	80

Practical:

Skills to be developed:

Intellectual Skills:

1. Reading
2. Sourcing of Web sites

Motor Skill:

1. Testing
2. Measurement

List of Practical:

1. Pressure Measurement by using strain gauge or To study pressure sensing elements (Bourdon tube, Diaphragm etc)
2. Calibration of pressure gauge by using dead weight pressure gauge tester.
3. Flow rate Measurement by using Rotameter

- Or Flow rate Measurement by using venturi.
- Or Flow rate Measurement by using Orifice
- 4. Level Measurement by using air purge system.
- 5. To plot the Characteristics of RTD (PT-100) and Thermocouple
- 6. Speed Measurement by using Tachometer
- 7. Humidity Measurement by using Hygrometer
Or Vibration Measurement
- 8. Displacement or Position Measurement by using rotary encoder
- 9. Displacement Measurement by using LVDT
- 10. Calibration of Temperature Measuring Instrument

NOTE:

Take at least one Practical on Temperature transducer
 Take at least one Practical on Pressure transducer
 Take at least one Practical on Flow transducer
 Others are compulsory

Learning Resources:

Books:

Sr. No.	Author	Title	Publisher
1	S.K.Singh	Industrial Instrumentation and control	Tata McGraw Hill
2	A.K.Sawhney	Electrical and Electronic Measurements and Instrumentation	Dhanpat Rai & Sons,
3	D.Patranabis	Principles of Industrial Instrumentation	Tata McGraw Hill
4	B.C.Nakra K.K.Chawdhry	Instrumentation Measurement and Analysis	Tata McGraw Hill
5	Rangan Mani Sharma	Instrumentation systems and devices	Tata McGraw Hill
6	Bela Liptak Kriszta Venczel	Process Measurement Instrument Engineers Handbook	Chilton Book Company