Subject : Elect & Electronic Measurement

Subject Code : ECE305

L	T	P	Full marks 100 Th (80+20)
3		2	Hours 42

1. **Introduction to Measurements** – **06 hrs**
   Block diagram of measurement system, characteristics of measurement system, Accuracy & precision, Repeatability, range, linearity and offsets. Errors and its types. Calibration of instruments.

2. **Analog Instruments** - **06 hrs**
   Construction and principle of operation of moving coil, moving iron, Dynamometer, Thermal and Rectifier type deflecting instruments. Deflecting, controlling and damping torques, extension of instrument ranges using shunts, multipliers and instrument transformers, multi meters, meager, localization of cable faults.

3. **DC & AC Bridges** : **06 hrs**
   Wheat stone bridge, Kelvin brifge, Kelvins double bridge AC bridge concept, Maxwell bridge, shearing bridge.

4. **ELECTRONIC INSTRUMENTS** – **04 hrs**
   Electronic Voltmeter, Electronic Multi meters, Digital Voltmeter, and Component Measuring Instruments: Q meter, Vector Impedance meter, RF Power & Voltage Measurements, Introduction to shielding & grounding.

5. **OSCILLOSCOPES** – **06 hrs**
   Basic CRO concept, CRO Probes, Techniques of Measurement of amplitude, frequency, Phase Angle, time period, time delay, Multi beam, multi trace, Storage & Sampling Oscilloscopes, Digital Storage Oscilloscope.

6. **SIGNAL GENERATION AND SIGNAL ANALYSIS** – **06 hrs**
   Sine wave generators, multi function generator, Signal Analysis - Measurement Technique, Wave Analyzers, and Frequency - selective wave analyzer, Heterodyne wave analyzer, Harmonic distortion analyzer, and Spectrum analyzer.

7. **TRANSDUCERS** - **08 hrs**
   Transducers and actuators, Classification, Selection Criteria, Characteristics, Working Principles and Application of following Transducers:- RTD, Thermocouples, Thermistors, LVDT, Strain Gauges, Bourdon Tubes, Accelerometers, Taco generators, Load Cell, Piezoelectric Transducers, Ultrasonic Flow Meter.

Subject – Elect & Electronic Measurement Lab

Subject Code – ECE309

List of Practical's

1. Instrument workshop- observe the construction of PMMC, Dynamometer, Electro thermal and Rectifier type instrument,
Oscilloscope and digital multi meter
2. Calibrate moving iron and electrodynamometer type ammeter/voltmeter by potentiometer
3. Calibrate dynamometer type Wattmeter by potentiometer
4. Calibrate A.C. energy meter
5. Measure the resistivity of material using Kelvin Double Bridge
6. Measurement of Power using Instrument transformer
7. Measurement of Power in Poly phase circuits
8. Measurement of Frequency by Wien Bridge using Oscilloscope
9. Measurement of Inductance by Anderson Bridge
10. Measurement of Capacitance by De Sauty Bridge
11. Measurement of frequency by CRO using lissajos figure
12. Study of two Channel Voltage to Circuit transmitter (V-I Transmitter)
13. Study of two Channel I-V Receiver (Converter).
14. Temperature measurement using AD590 Semiconductor temperature sensor.
15. Displacement measurement by Capacitive Transducer.
16. Pressure & Displacement measurement by Linear Variable Displacement Transducer (LVDT).
17. Study of load cell. (To study the load cell behavior for tensile & compressive load).
18. Torque measurements by Strain Gauge Transducer.
19. Measurement of linear displacement using Inductive Displacement Transducer.
20. Measurement of speed using Magnetic Pick-Up Proximity Sensor.
21. Relative Humidity measurement using Capacitive Transducer.
22. Displacement measurement by Magnetic Bi-Polar Digital Position Sensor (using Hall Effect).
23. Measurement of angular speed by Stroboscope.
24. Studies of L.D.R
25. Studies of Photo Diodes & Photo Voltaic cells.
26 Study of transducers and measurement of parameters

Reference Books

1. Golding E.W. & Wides F.C. : Electrical Measuring Instruments & Measurements ; Wheeler
2. Electronic Instrumentation – H.S. Kalsi, ISTE/EXCEL BOOKS
3 Singh:Industrial Instrumentation &control 2/e Tata Mcgraw-Hill,NewDel
4 Sawhney A K : A course in Electrical & Electronic Measurements & Instruments, Dhanpat rai
5 Kalsi:Electronic Instrumentation TMH
6 Heltrick A.D. & Cooper W.D. : Modern Electronic Instrumentation & Measuring Instruments; Wheeler
7 Patranabis D: Sensors & Transducers, Wheeler 96
8 R.V.Jalgaonkar.: Electronics Instrumentation.
9 Sutko: Industrial Instrumentations
10 Bolton W: Instrumentation & Process Measurement, Universities Press
11 Reissland: Electrical Measurement, New Age International