

PCEE4204 Electrical and Electronics Measurement

MODULE- I

(14 Hrs)

1. **INTRODUCTION:** (a) *Measurement and Error:* Definition, Accuracy and Precision, Significant Figures, Types of Errors. (b) *Standards of Measurement:* Classification of Standards, Electrical Standards, IEEE Standards.
2. **MEASUREMENT OF RESISTANCE, INDUCTANCE and CAPACITANCE:** (a) *Resistance:* Measurement of Low Resistance by Kelvin's Double Bridge, Measurement of Medium Resistance, Measurement of High Resistance, Measurement of Resistance of Insulating Materials, Portable Resistance Testing set (Megohmmeter), Measurement of Insulation Resistance when Power is ON, Measurement of Resistance of Earth Connections. (b) *Inductance:* Measurement of Self Inductance by Ammeter and Voltmeter, and AC Bridges (Maxwell's, Hay's, & Anderson Bridge), Measurement of Mutual Inductance by Felici's Method, and as Self Inductance. (c) *Capacitance:* Measurement of Capacitance by Ammeter and Voltmeter, and AC Bridges (Owen's, Schering & Wien's Bridge), Screening of Bridge Components and Wagner Earthing Device.

MODULE- II

(14 Hrs)

3. **GALVANOMETER:** Construction, Theory and Principle of operation of D'Arsonval, Vibration (Moving Magnet & Moving Coil types), and Ballistic Galvanometer, Influence of Resistance on Damping, Logarithmic decrement, Calibration of Galvanometers, Galvanometer Constants, Measurement of Flux and Magnetic Field by using Galvanometers.
4. **AMMETER and VOLTMETER:** Derivation for Deflecting Torque of; PMMC, MI (attraction and repulsion types), Electro Dynamometer and Induction type Ammeters and Voltmeters.
5. **POTENTIOMETER:** Construction, Theory and Principle of operation of DC Potentiometers (Crompton, Vernier, Constant Resistance, & Deflectional Potentiometer), and AC Potentiometers (Drysdale-Tinsley & Gall-Tinsley Potentiometer).
6. **MEASUREMENT OF POWER, ENERGY, FREQUENCY and POWER FACTOR:** Measurement of single phase and three phase power by wattmeter, Construction, Theory and Principle of operation of (a) Electro-Dynamometer and Induction type Wattmeters, (b) Single Phase and Polyphase Induction type Watt-hour meters, (c) Frequency Meters, and (d) Power Factor Meters.

MODULE- III

(14 Hrs)

7. **CURRENT TRANSFORMER and POTENTIAL TRANSFORMER:** Construction, Theory, Characteristics and Testing of CTs and PTs.
8. **ELECTRONIC INSTRUMENTS FOR MEASURING BASIC PARAMETERS:** Amplified DC Meters, AC Voltmeters using Rectifiers, True RMS Voltmeter, Considerations for choosing an Analog Voltmeter, Digital Voltmeters (Block Diagrams only), Q-meter.
9. **OSCILLOSCOPE:** Block Diagrams, Delay Line, Multiple Trace, Oscilloscope Probes, Oscilloscope Techniques, Introduction to Analog and Digital Storage Oscilloscopes, Measurement of Frequency, Phase Angle, and Time Delay using Oscilloscope.
10. **COUNTERS and ANALYZERS:** Introduction to Wave, Harmonic Distortion and Spectrum Analyzers, Frequency Counters, Computer Controlled Test Systems: Testing an Audio Amplifier.

Text Book(s) :

1. Electrical Measurements and Measuring Instruments – Golding & Widdis – 5th Edition, Reem Publication (*For sections 2 to 6: Selected Portions from Ch. -VI, VII, IX, XIX, XX, XXI & XXII*).
2. Modern Electronic Instrumentation and Measurement Techniques – Helfrick & Cooper – Pearson Education (*For sections 1, 7 to 9: Selected Portions from Ch. -1, 3, 6, 7, 9, 10, and 13*).

Reference Book(s):

3. A Course in Electrical and Electronic Measurements and Instrumentation – A K Sawhney – Dhanpat Rai & Co.
4. Elements of Electronic Instrumentation and Measurement – Joshep Carr – 3rd Edition, Pearson Education.
5. Electronic Instrumentation – H C Kalsi – 2nd Edition, Tata McGraw Hill.
6. Electronic Measurement and Instrumentation – Oliver & Cage – Tata McGraw Hill.