III Year I Semester

15AEE17-ELECTRICAL MEASUREMENTS

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Course Objectives:

This course enables the students to

- *Understand the basic principles of all measuring instruments and calibration of different measuring instruments.*
- *Study the measurement of RLC parameters, voltage, current, Power factor, power, energy and magnetic parameters.*
- *Understand the concepts of Instrument transformers*
- *Study the concepts of D.C & A.C bridges.*

UNIT- I MEASURING INSTRUMENTS

Classification – Deflecting, Control and Damping Torques – Ammeters and Voltmeters – PMMC, Dynamometer, Moving Iron Type Instruments – Expression for the Deflecting Torque and Control Torque – Errors and Compensations, Extension of range using Shunt and Series Resistance. Cathode Ray Oscilloscope- Cathode Ray tube-Time base generator-Horizontal and Vertical Amplifiers – Application of CRO – Measurement of Phase, Frequency, Current & Voltage- Lissajous Patterns

UNIT – II MEASUREMENT OF POWER AND ENERGY

Single Phase Dynamometer Wattmeter-LPF and UPF-Double Element and Three Element Dynamometer Wattmeter, Expression for Deflecting and Control Torques. Types of P.F. Meters – Dynamometer and Moving Iron Type – 1-Φ and 3-Φ Meters.Single Phase Induction Type Energy Meter – Driving and Braking Torques – Errors and Compensations.Three Phase Energy Meter.

UNIT – III INSTRUMENT TRANSFORMERS AND POTENTIOMETERS

CT and PT – Ratio and Phase Angle Errors – Design Considerations.

Potentiometers: Principle and Operation of D.C. Crompton's Potentiometer –Standardization – Measurement of unknown Resistance, Current, Voltage. A.C. Potentiometers: Polar and Coordinate types- Standardization – Applications.

UNIT – IV D.C & A.C BRIDGES

Method of Measuring Low, Medium and High Resistance – Sensitivity of Wheat stone's Bridge – Kelvin's Double Bridge for Measuring Low Resistance, Measurement of High Resistance – Loss of Charge Method. Measurement of Inductance - Maxwell's Bridge, Anderson's Bridge. Measurement of Capacitance and Loss Angle - Desauty Bridge.Wien's Bridge – Schering Bridge.

UNIT – V MAGNETIC MEASUREMENTS

Ballistic Galvanometer – Equation of Motion – Flux Meter – Constructional Details, Comparison with Ballistic Galvanometer.Determination of B-H Loop Methods of Reversals - Six Point Method – A.C. Testing – Iron Loss of Bar Samples.

BOS-chairman

Course Outcomes:

The students will have knowledge on the following concepts

- *The basic laws governing the operation of electrical measuring instruments, relevant circuits and their working.*
- *Measurement of R,L,C ,Voltage, Current, Power factor , Power, Energy*
- *Calculation of unknown values by balancing the bridges.*
- *Measurement of frequency, phase with Oscilloscope.*
- *Calculation of magnetic parameters using magnetic measuring instruments.*

TEXT BOOKS:

1. Electrical & Electronic Measurement & Instruments by A. K. SawhneyDhanpatRai & Co. Publications.
2. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications.

REFERENCE BOOKS:

1. Electronic Instrumentation by H. S. Kalsi, Tata GrawhillMc, 3rd Edition.
2. Electrical Measurements – by Buckingham and Price, Prentice – Hall
3. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, Publishers
4. Electrical & Electronic Measurement & Instrumentation by R. K. Rajput, 2nd Edition, S. Chand & Co.

V. Sarma
BOS-chairman