

# JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

III Year B.Tech. EEE-II Sem

L	T/P/D	C
4	-/-	4

## (A60223) ELECTRICAL AND ELECTRONICS INSTRUMENTATION

### Objective:

Electrical measurements course introduces the basic principles of all measuring instruments. It also deals with the measurement of RLC parameters voltage, current Power factor, power, energy and magnetic measurements.

### UNIT-I:

**Introduction to Measuring Instruments :** Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type – Extension of range of E.S. Voltmeters.

### UNIT – II:

**Potentiometers & Instrument Transformers:** 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. CT and PT – Ratio and phase angle errors.

### UNIT –III:

**Measurement of Power & Energy:** Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems.

Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading using R.S.S. meter. Three phase energy meter – tri-vector meter, maximum demand meters.

### UNIT – IV:

**D.C & A.C Bridges:** Method of measuring low, medium and high resistance – sensitivity of wheat-stone's bridge – carey foster's bridge, kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method.

Measurement of inductance- Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle - Desauty Bridge. Wien's bridge – Schering Bridge.

### UNIT-V:

**Transducers & Oscilloscopes:** Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermocouples, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

**CRO:** Cathode ray oscilloscope-Cathode ray tube-time base generator-horizontal and vertical amplifiers-CRO probes-applications of CRO-Measurement of phase and frequency-lissajous patterns.

### TEXT BOOKS:

1. Electrical and Electronic Measurements and Instrumentation, R. K. Rajput, S. Chand & Company Ltd.
2. Electrical Measuring Instruments and Measurements, S. C. Bhargava, BS Publications.

### REFERENCE BOOKS:

1. Electrical & Electronic Measurement & Instruments, A.K.Sawhney Dhanpat Rai & Co. Publications.
2. Electrical and Electronic Measurements, G. K. Banerjee, PHI Learning Pvt. Ltd.
3. Electrical Measurements and Measuring Instruments, Golding and Widdis, Reem Publications.
4. Electrical Measurements, Buckingham and Price, Prentice – Hall
5. Electrical Measurements: Fundamentals, Concepts, Applications, Reissland, M.U, New Age International (P) Limited, Publishers.
5. Electrical Measurements and measuring Instruments, E.W. Golding and F.C. Widdis, fifth Edition, Wheeler Publishing.

### Outcome:

After going through this course the student gets a thorough knowledge on, different types of measuring instruments their construction operation and characteristics, resistance voltage current measurements through potentiometers, voltage current measurements through instrument transformers, power and energy measurements through watt and energy meters, resistance measurements through DC bridges, capacitance and inductance measurements through AC bridges, operation of different types of transducers, measurement of phase and frequency through CRO, range extension of measuring instruments and different types of errors & their reduction methods in measuring instruments, with which he/she can able to apply the above conceptual things to real-world electrical and electronics problems and applications.