

ELECTRICAL MEASUREMENTS & INSTRUMENTATION

B.TECH III YEAR I SEM

Course Code	Category	Hours/ Week			Credits	Maximum Marks		
		L	T	P		CIA	SEE	TOTAL
EE3101PC	Professional Core				3			
		3	0	0		40	60	100
Contact Classes: 48	Tutorial Classes:	Practical Classes: Nil			Total Classes:48			

Pre-requisite: Basic Electrical Engineering, Analog Electronics, Electrical Circuit Analysis & Electro Magnetic fields.

Course objectives:

- To introduce the basic principles of all measuring instruments.
- To deal with the measurement of voltage, current, Power factor, power, energy and magnetic measurements.
- To understand the basic concepts of smart and digital metering.

Course Outcomes: After completion of this course, the student will be able to

- Apply the different types of measuring instruments, their construction, operation and characteristics
- Identify the suitable meters for the measurement of voltage and current
- Classify the instruments suitable for typical measurements of power and energy
- Make use of suitable bridges for the measurement of R, L and C
- Decide transducers and digital meters for industrial applications.

UNIT-I Introduction to Measuring Instruments

SI Units-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 Voltmeter 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 type's standardization – applications. CT and PT- Ratio and phase angle errors.

UNIT-III Measurement of Power&Energy

Singlephasedynamometerwattmeter,LPFandUPF,Doubleelementandthreeelementdynamomet
er wattmeter, expression for deflecting and control torques – Extension of range of wattmeter
using instrument transformers – Measurement of active and reactive powers
inbalancedandunbalancedsystems.Singlephaseinductiontypeenergymeter– 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 DC&ACBridges

Method of measuring low, medium and high resistance – sensitivityofWheat-stone'sbridge
– Carey Foster's bridge, Kelvin's double bridge for measuring low
resistance,measurementofhighresistance–lossofchargemethod.Measurementofinductance-
Maxwell'sbridge,Hay'sbridge,Anderson'sbridge-
Owen'sbridge.Measurementofcapacitanceandlossangle–Desaunty'sBridge-Wien'sbridge–
ScheringBridge.

UNIT-V Transducers

Definitionoftransducers,Classificationoftransducers,AdvantagesofElectricaltransducers,
Characteristics and choice of transducers; Principle operation of LVDT andcapacitor
transducers; LVDT Applications, Strain gauge and its principle ofoperation,gauge factor,
Thermistors, Thermocouples, Piezoelectric transducers, IntroductiontoSmart and Digital
Metering: Digital Multi-meter, True RMS meters, Clamp-on meters,Digital Storage
Oscilloscope.

TEXTBOOKS:

1. G.K.Banerjee,“ElectricalandElectronicMeasurements”,PHILearning
Pvt.Ltd.,2ndEdition,2016
2. S. C. Bhargava, “Electrical Measuring Instruments and
Measurements”, BSPublications,2012.

REFERENCES:

1. A.K. Sawhney, “Electrical & Electronic
Measurement & Instruments
”,DhanpatRai&Co.Publications,2005.
2. R.K.Rajput,“Electrical&ElectronicMeasurement&Instrumentation”,S
.ChandandCompanyLtd.,2007.
3. BuckinghamandPrice,“ElectricalMeasurements”,Prentice–Hall,1988.
4. Reissl and, M. U, “Electrical Measurements:
E.W.GoldingandF.C.Widdis,“ElectricalMeasur
ementsandmeasuringInstruments”,fifth
Edition,WheelerPublishing,2011.