

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY ANANTAPUR
COLLEGE OF ENGINEERING (Autonomous), PULIVENDULA
ELECTRICAL AND ELECTRONICS ENGINEERING

II B.TECH II SEM

L T C
3 0 3

Electrical and Electronic Measurements

Course Objectives: The student has to acquire knowledge about:

1. The basic principles of different types of electrical instruments for the measurement of voltage, current, power factor, power and energy.
2. The measurements of RLC parameters using bridge principles.
3. The principles of magnetic measurements
4. The principle of working of CRO and its applications

UNIT- I MEASURING INSTRUMENTS

Classification – Ammeters and Voltmeters – PMMC, Dynamometer, Moving Iron Types – Expression for the Deflecting Torque and Control Torque – Errors and their Compensation, Extension of range – Numerical examples

Learning Outcomes: *At the end of the unit, the student will be able to*

1. Understand the operation of different instruments.
2. Know the different types of errors and their compensation
3. Distinguish between MC and MI type of instruments
4. Know how control of torque is required in measurements
5. Solve numerical examples and interchangeability of ammeters as voltmeters and vice-versa

UNIT – II MEASUREMENT OF POWER, POWER FACTOR AND ENERGY

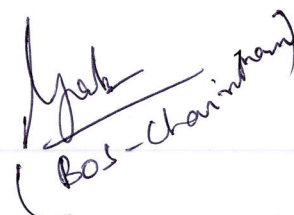
Single Phase Dynamometer Wattmeter, LPF and UPF, Double Element and Three Elements, Expression for Deflecting and Control Torques; P.F. Meters: Dynamometer and Moving Iron Type – 1-ph and 3-ph Power factor Meters. Single Phase Induction Type Energy Meter – Driving and Braking Torques – Errors and their Compensation, Three Phase Energy Meter – Numerical examples

Learning Outcomes: *At the end of the unit, the student will be able to*

1. Understand the working principles and construction of different types of Energy meters
2. Calculate the different parameters of the meters
3. Distinguish between low and high power factor ranges in watt meters
4. Know about occurrence of errors and need for compensation for precise and accurate measurement
5. Distinguish between 3- ϕ power factor meters and Energy meters

UNIT – III INSTRUMENT TRANSFORMERS, POTENTIOMETERS, AND MAGNETIC MEASUREMENTS

Current Transformers and Potential Transformers – Ratio and Phase Angle Errors – Methods for Reduction of Errors-Design Considerations. DC Potentiometers: Principle and


(Bob Chaitany)

Operation of D.C. Crompton's Potentiometer –Standardization – Measurement of unknown Resistance, Currents and Voltages. A.C. Potentiometers: Polar and Coordinate types- Standardization – Applications. Determination of B-H Loop Methods of Reversals - Six Point magnetic measurement Method –
A.C. Testing – Iron Loss of Bar Samples – Numerical Examples

Learning Outcomes: *At the end of the unit, the student will be able to*

1. Understand the principles and working of various measuring instruments used to detect electrical circuit parameters R,L,C
2. Design the various voltage and current measuring instruments for the various electric / magnetic field applications
3. Distinguish between CTs and PTs
4. Distinguish between DC and AC potentiometers
5. Identify errors in measurements and to mitigate them for desired precision and accuracy

UNIT – IV D.C & A.C BRIDGES

Method of Measuring Low, Medium and High Resistances – Sensitivity of Wheatstone'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 – Numerical Examples

Learning Outcomes: *At the end of the unit, the student will be able to*

1. Understand the bridge configurations and their applications for various ranges of resistance measurement
2. Compute the unknown parameters of Inductance using the bridges
3. Compute the unknown parameters of Capacitance using the bridges
4. Be able to select appropriate bridge configuration for measurement of R,L and C

UNIT – V CRO AND DIGITAL METERS

Cathode Ray Oscilloscope- Cathode Ray Tube-Time Base Generator-Horizontal and Vertical Amplifiers – Applications of CRO – Measurement of Phase, Frequency, Current and Voltage- Lissajous Patterns.

Digital Voltmeters-Successive Approximation, Ramp, and Integrating Type-Digital Frequency Meter-Digital Multimeter-Digital Tachometer.

Learning Outcomes: *At the end of the unit, the student will be able to*

1. Understand the operation of CRO and its parts
2. Know about various applications of CRO
3. Understand various Lissajous patterns
4. Know about Digital voltmeters and Distinguish between analog and digital meters
5. Know about measurement of speed using Tachometer and to distinguish between analog and digital ones

TEXT BOOKS:

Yash
(BOS- Chairman)

TEXT BOOKS

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications, 2007.
2. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, 5th Edition, Reem Publications, 2011.

REFERENCE BOOKS:

1. Electronic Instrumentation by H. S. Kalsi, Tata Mcgrawhill, 3rd Edition, 2011.
2. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New Age International (P) Limited, 2010.
3. Electrical & Electronic Measurement & Instrumentation by R. K. Rajput, 2nd Edition, S. Chand & Co., 2nd Edition, 2013.

Course Outcomes:

1. Able to Understand the working of various instruments and equipments used for the measurement of various electrical engineering parameters like voltage, current, power, phase etc in industry as well as in power generation, transmission and distribution sectors
2. Able to analyze and solve the varieties of problems and issues coming up in the vast field of electrical measurements.
3. Analyse the different operation of extension range ammeters and voltmeters, DC and AC bridge for measurement of parameters and different characteristics of periodic and aperiodic signals using CRO.
4. Design and development of various voltage and current measuring meters and the varieties of issues coming up in the field of electrical measurements.


BOS (Chairman)