

Course Syllabi: UEI403 Electrical and Electronic Measurements (L : T : P :: 3 : 1 : 2)

1. **Course number and name:** UEI403; Electrical and Electronic Measurements

2. **Credits and contact hours:** Credits: 4.5; Hours: 6

3. **Text book, title, author, and year**

- *Golding, E.W., and Widdis, F.C., Electrical Measurements and Measuring Instruments, Pitman (2003).*
- *Helfrick, A.D., and Cooper, W.D., Modern Electronic Instrumentation and Measurement Techniques, Prentice Hall of India (2007).*
- *Kalsi, H.S., Electronic Instrumentation, Tata McGraw-Hill (2007) 2nd ed.*
- *Nakra, B.C., Chaudhry, K.K., Instrumentation Measurement and Analysis, Tata McGraw-Hill (2003) 2nd ed.*

a. Other supplemental materials

- Nil

4. **Specific course information**

a. Brief description of the content of the course (catalog description)

Units, Systems and Standards: Review of System of Units, SI Units, Classification of Standards, Time and Frequency Standards, Electrical Standards: Standards of Emf and Resistance, Frequency Dependence of Resistance, Inductance and Capacitance.

Electromechanical Indicating Instruments: PMMC Galvanometer, Ohmmeter, Electrodynamometer, Moving Iron Meter, Rectifier and Thermo-Instruments, Comparison of Various Types of Indicating Instruments.

Power and Energy Measurement: Electrodynamometer Type of Wattmeter and Power Factor Meter, Power in Poly Phase System: Two Wattmeter Method, Single-Phase Induction and Electronic Energy Meters.

Bridge Measurements: Wheatstone Bridge and its Sensitivity Analysis, Kelvin Double Bridge, AC Bridges: Applications and Conditions for Balance, Maxwell's Bridge, Hay's Bridge, Schering Bridge, Wien's Bridge, De Sauty's Bridge, Insulation Testing, Ground Resistance Measurement, Varley and Murray Loop Test.

Instrument Transformers: Current and Voltage Transformers, Constructional Features, Ratio and Phase Angle Errors.

Magnetic Measurements: Determination of B-H Curve and Hysteresis Loop, Measurement of Iron Losses with Llyod Fisher Square.

Electronic Instruments: Basic Principle and Advantages, D.C. Voltmeter with Direct Coupled Amplifier, Chopper Stabilized Amplifier, Electronic Multimeter, Digital Voltmeters, General Characteristics Ramp Type Voltmeter, Quantization Error, Digital Frequency Meter/Timer, Q Meter and its Applications, Distortion Meter, Wavemeter and Spectrum Analyzer, Oscilloscopes: Block Diagram, CRT, Electrostatic Deflection, CRT Circuits, Multi-Beam and Multitrace Oscilloscopes, Applications of Oscilloscopes, Storage Type Digital Oscilloscopes.

Laboratory Work: Experiments Around Sensitivity of Wheat Stone Bridge, Comparison of Various Types of Indicating Instruments, Single-Phase Induction Type Energy Meter, Kelvin Double Bridge, AC Bridges, Measurement of Iron Losses with Llyod Fisher Square, Storage Type Digital Oscilloscopes.

5. Specific goals for the course

After the completion of the course, the students will be able to:

- Distinguish various Electromechanical Indicating Instruments.
- Describe the role of Instrument Transformers.
- Explain the working and application of various electronic instruments such as CRO, Spectrum Analyzer etc.
- Apply AC and DC Bridges for various measurements.

6. Brief list of topics to be covered

- Electromechanical Indicating Instruments
- Power and Energy Measurement
- Bridge Measurements
- Instrument Transformers
- Magnetic Measurements
- Electronic Instruments