

GUJARAT TECHNOLOGICAL UNIVERSITY

ELECTRICAL & ELECTRONICS ENGINEERING

B. E. SEMESTER: VII

Subject Name: **Electrical and Electronics Measuring Instruments**

Subject Code: **170803**

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	University Exam (E)		Mid Sem Exam (Theory) (M)	Practical (Internal)
				Theory	Practical		
3	0	2	5	70	30	30	20

Sr. No	Course Content	Total Hrs.
1.	Electrical Measurements: Standards of Measurement & Errors, Review of indicating and integrating instruments: Voltmeter, Ammeter, Wattmeter, Multimeter and Energy meter.	7
2.	Measurement of Resistance, Inductance and Capacitance Measurement of low, medium and high resistances, insulation resistance measurements, AC bridges for inductance and capacitance measurement.	6
3.	Instrument Transformers Current and Potential transfers, ratio and phase angle errors, design consideration and testing.	6
4.	Electronic Measurements Electronic Voltmeter, Multimeter, wattmeter & energy meter. Time, frequency and phase angle measurements using CRO; Spectrum & wave analyzer. Digital counter, frequency meter, voltmeter, Multimeter and storage oscilloscope.	7
5.	Instrumentation Transducers, classification & selection of transducers, strain gauges, inductive & capacitive transducers, piezoelectric and Hall-effect transducers, thermistors, thermocouples, photo-diodes & photo-transistors encoder type digital transducers, signal conditioning and telemetry, basic concepts of smart sensors and application. Data Acquisition Systems.	8

Laboratory & Assignments:

- Study of Kelvin's Bridge and its application for measurement of low resistance.
- Price Guard-wire method for measurement of high resistance.
- Loss of charge method for measurement of insulation resistance.
- Schering Bridge for measurement of capacitance and loss angle.
- Measurement of inductance and Q-factor using AC bridges.
- Measurement of ratio and phase angle errors of instrument transformers using (a) comparison method (b) absolute method.
- Study and use of (a) integrating type (b) dual-slope type electronic voltmeters. Spectrum analyzer and its use for analyzing frequency spectra of periodic and non periodic signals.
- Study and use of LVDT or displacement transducers.
- Resistance strain gauges using unbalance bridge circuits.
- Study and use of grey-coded disk or digital transducer.
- Study and use of time-division and frequency-division multiplexing.
- Phase locked loops and applications for phase measurements.

Text Books:

1. Sawhney, A.K., "A Course in Electrical and Electronic Measurements and Instrumentation", Dhanapat Rai & Sons, New Delhi, 2000
2. Helfrick, Albert D., Cooper, William D., "Modern Electronic Instrumentation And Measurement Techniques", PHI Learning

Reference Books:

1. Jones, B.E., "Instrumentation Measurement and Feedback", Tata McGraw-Hill, 1986.
2. Slawomir Tumanski, "Principles of Electrical Measurement", Taylor & Francis; 1st ed., 2006.
3. Kishore, K Lal "Electronic Measurements and Instrumentation", Pearson Education, New Delhi, 2010.