GUJARAT TECHNOLOGICAL UNIVERSITY
Syllabus for Bachelor of Vocation (B.Voc.), 3rd Semester
Branch: Solar & Renewable Energy
Subject Name: Electrical Measurement & Instrumentation
Subject Code: 1130703

Type of course: Under Graduate

Prerequisite: Basic of Measurement and instrumentation

Rationale: Electrical installations ranging from residential consumers to huge industrial estates all are equipped with measuring instruments. In view of this, study of principles of Electrical measurements and measuring instruments becomes mandatory for all electrical engineers. This subject deals with principles of measurements, analog and measuring instruments as well as transducers.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE(E)	PA(M)	ESE(V)	PA(I)	
3	0	0	3	50	0	0	0	50

Content:

Sr. No.	Topic	No. of Hours	Module Weightage
01	**Concepts of Measurement :** Measurement System, Classification of instrument system, Methods of Measurement, Static Characteristics like accuracy, precision, sensitivity, linearity, range, drift, threshold, dead zone etc. Errors in measurement.	7	**10%**
02	**Transducers and Sensors :** Definition, different types of transducers, criteria for selection, general characteristics and dynamic characteristics, transducers for measurement of temperature (Thermocouple and RTD), pressure, strain, displacement, speed, Distance. (Sensors – basic concept – Speed and position sensors)	10	**20%**
03	**Measurement of Parameters:** PMMC & Moving Iron instrument. Electrodynamometer Instrument. Extending the range of meters - Shunts, Instrument Transformer and their applications. Measurement of voltage, current, power, energy, power factor. (constructions and operating principles of corresponding instruments)	10	**30%**
04	**Measurement of R, L and C:** Different methods of measuring resistances using Wheatstone Bridge, Measurement of inductance & capacitance with the help of AC Bridges (Maxwell bridge, Schering Bridge) Measurement of Frequency using Wien Bridge. Measurement of Insulation resistance using Megger.	8	**20%**

05	**Digital Instrument for Measurement:** Different types of digital measuring instrument like DVM and Digital multi meter, Clamp on meter, LCR meter. Digital Storage Oscilloscope. Digital Energy Meter. (Block Diagram, theory and applications)	7	**10%**

Distribution of marks weightage for cognitive level:

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	-	-	-

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze, E: Evaluate C: Create above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Gupta J. B., "A Course in Electronics and Electrical Measurements and Instrumentation", S. K. Kataria & Sons.
2. A. K. Sawhney, "Electrical and Electronic Measurements and Instrumentation", DHANPAT RAI & CO.
3. R. K. RAJPUT, "Electronic Measurements & Instrumentation.", S. CHAND & COMPANY LTD.

Course Outcome:

Sr. No.	**CO statement**	**Marks% weightage**
CO1	Comprehend the basics of electrical measurements.	20
CO2	Explain basic principle, working, characteristics and applications of the various measuring instruments and transducers.	50
CO3	Apply AC and DC bridges for measurement of electrical parameters like resistance, inductance and capacitance.	20
CO4	Prepare the specifications of required measurement systems to be used for measurement of parameters for a specified application.	10