SARVAJANIK UNIVERSITY
SarvajanikCollege of Engineering and Technology
Bachelor of Technology

B.Tech. III Semester V

Subject Name: Electrical and Electronic Measurement **Subject Code: BTEL15502**

Type of course: **Open Elective Course**
Prerequisite: Basic Electrical Engineering
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 measurements becomes significant. This subject deals with principles of measurements, analog and measuring instruments as well as electronic meters.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	150
3	0	2	4	60	25	15	30	20	

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1.	**Measurement Systems** :- Static performance characteristics of measurement system, Standards: Standards and their classification, electrical standards: emf, current, resistance, inductance, and capacitance.	**05**	**11**
2.	**Measurement of Resistance, Inductance and Capacitance:** Classification of resistances, Kelvin's bridge, Wheatstone's bridge, meggar, General four arm a.c. bridge network, Hay's; Schering bridge network, LCR meter - working principle with block diagram, Localization of cable fault using loop methods	08	**18**
3.	**Indicating Instruments :** Classification, operating principles, general construction details of indicating instruments, balancing, control and damping method, theory and construction of electrostatic instruments, electrodynamometer type instruments, measurement of power, energy meter – single phase and poly-phase, industrial metering and tariffs	13	**28**

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4.	**Instrument Transformers :** Theory of current and potential transformers, ratio error and phase angle, testing of CT/PT : Biffi's method; and clothier – Medina method, use of CT/PT for extension of instruments range and measurement of power	08	**18**
5.	**Electronic Meters And Oscilloscope:** Electronic voltmeter, difference amplifier type of EVM, EVM using rectifiers, true RMS reading voltmeter, differential voltmeter, Oscilloscope block diagram, CRT and its circuits, vertical deflection systems, delay line, multiple trace, horizontal deflection system, oscilloscope probes	07	**15**
6.	**Digital instruments:** Digital meter displays: LED and LCD, Digital voltmeters, Digital multi meter, Digital Storage Oscilloscope - Block Diagram, theory and applications.	04	**10**

Suggested Specification table with Marks (Theory/Practical):

% Distribution of Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
05	**15**	**25**	**10**	**10**	**05**

Legends: R: Remembrance, **U:** Understanding; **A:** Application, **N:** Analyze, **E:** Evaluate **C:** Create and 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 Text Books:

Sr. No.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Publication Edition
1	Electrical and ElectronicMeasurements and Instrumentation	A.K.Sawhney	DHANPAT RAI & CO	2015	
2	Electrical Measurement and Measurement instrument	Golding &Widis	Wheelar Books		
3	A Course in Electronics and Electrical Measurements and Instrumentation	Gupta J. B	S.K. Kataria& Sons		
4	Measurement systems	Ernest O. Doebelin	Tata-	2011	6th Edition

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			McGraw Hill,		
5	Modern Electronic Instrumentation & Measuring Instruments	A. D. Heltrick&W.D. Cooper	PHI	1992	

Course Outcome:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Comprehend the basics of electrical measurements and digital instruments.	20
CO-2	Describe the importance of bridges networks (AC and DC) for the accurate measurement of various electrical parameters (R, L, C)	25
CO-3	Describe the importance and principle of operation of different indicating and integrating instruments	25
CO-4	Identify the necessity and utilization of instrument transformer for the measurement of current or voltage	15
CO-5	Operate electronic meters and oscilloscope	15

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	P O 11	PO1 2	PSO 1	PSO 2	PSO 3
CO-1	3	3	3	3	1	1	1		2		1		3		1
CO-2	3	2	2	2	1				2		1		3		
CO-3	3	2	2	2	2				3		1		3		
CO-4	3	2	2	3	2				3		1		3	2	
CO-5	2	2	2	2							1		3		
Rationale*															

Rationale*: Explaining why it is matching this particular program outcome

LIST OF PRACTICALS: (Minimum 8 performed.)

1. To measure value of unknown capacitance by Schering's bridge.
2. To measure unknown inductance by & demonstrate operation of Hay's bridge.
3. To demonstrate the Kelvin Double Bridge for Low resistance measurement.
4. To locate fault using Murray loop method.

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5. To locate fault using Varley loop method
6. To measure value of unknown resistance, inductance and capacitance using LCR meter.
7. To measure medium resistance using whetstone's bridge.
8. Measurement of current/voltage using shunt/multiplier.
9. Testing of CT by Biffi's method.
10. To study DSO.

Major Equipment:

1. LCR meter
2. Wheatstone bridge, Kelvin's double bridge
3. Hay's bridge, Schering bridge

List of Open Source/learning website:

- https://vlab.co.in
- https://nptel.ac.in