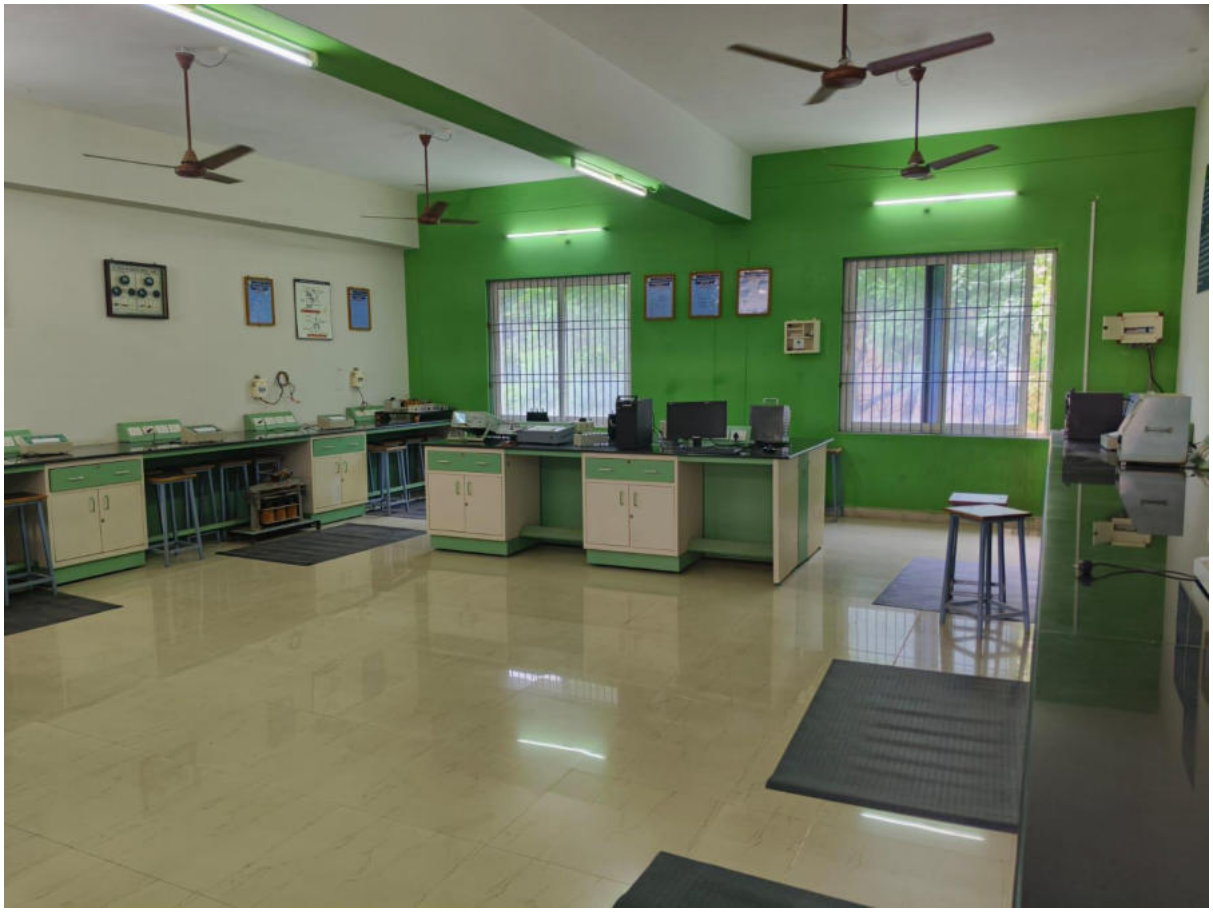
Electrical Measurements Lab



Description

This laboratory provides a comprehensive platform for students to explore and understand the fundamental and advanced aspects of electrical measurements. It begins with classical bridge circuits such as Wheatstone, Kelvin's Double Bridge, Anderson, Maxwell, Schering, and De-Sauty's bridges, which form the foundation for accurate determination of resistance, inductance, and capacitance.

The lab further emphasizes the calibration of electrical measuring instruments like energy meters, wattmeters, and power factor meters, which is essential for ensuring accuracy, reliability, and standardization in industrial and utility applications. In addition, students gain practical exposure to power and energy measurement techniques, including three-voltmeter, three-ammeter, and simulation-based methods for measuring active and reactive power in three-phase circuits.

The laboratory also covers insulation testing using a Megger, highlighting the importance of safety, preventive maintenance, and reliability in power systems. With simulation exercises, students learn how to model bridges and power measurement techniques in a virtual environment, preparing them for software-based analysis used in modern industries.

Finally, the lab introduces advanced test equipment like the Digital Storage Oscilloscope (DSO), enabling students to analyze waveforms, measure amplitude, frequency, time period, phase shift, and even compute RMS values from recorded data.

Altogether, this laboratory ensures that students not only acquire theoretical knowledge of measurement principles but also develop practical skills in handling instruments, performing calibration, minimizing errors, and interpreting results, which are critical for their professional development in electrical engineering and related fields.

Total Cost of the Laboratory: Rs. 9,44,832

List of Equipment

S.No	Name of the equipment	Qty.	Make/Supplier	Cost/Unit (Rs)	Total Cost (Rs)
1	Anderson Bridge Anderson Bridge	1 1	OSAW Energy Electrical	8,700-00 6,150-00	8,700-00 6,150-00
2	Schering Bridge Schering Bridge	1 1	OSAW Oxford	5,560-00 10,500-00	5,560-00 10,500-00
3	Kelvin's Double Bridge	1	OSAW	21,010-00	21,010-00
4	Wheat Stone Bridge	1	Oxford	10,000-00	10,000-00
5	Wien's Bridge	1	Oxford	11,500-00	11,500-00
4	Crompton DC Potentio Meter	1	OSAW	10,335-00	10,335-00
5	Dielectric Oil Testing	1	Zaran	25,500-00	25,500-00
6	CT Testing Silsbee's Method	1	Sree Ramanujam	60,840-00	60,840-00
7	Instrumentation Tutor Kit LVDT Trainer Kit	1 1	Itta Electronics Hi-Q Testing	12,265-50 8,650-00	12,265-50 8,650-00
8	Strain Gauge Module	1	Future Tech	6,635-00	6,635-00
9	3-Φ Loading Inductor	1	Itta Electronics	20,730-00	20,730-00
10	1-Φ Loading Inductors	2	Associate Engineers	5,950-00	11,900-00

S.No	Name of the equipment	Qty.	Make/Supplier	Cost/Unit (Rs)	Total Cost (Rs)
11	1-Φ Loading Capacitors	1 1	Associate Engineers Associate Engineers	5,850-00 5,850-00	5,850-00 5,850-00
12	1-Φ Auto Transformers / Dimmer Stat 230/(0-270)V	3 2 2 2	Allied Transformers Allied Transformers Lokesh Electro Tech Valika Electronics	3,750-00 3,750-00 6,510-00 6500-00	11,250-00 7500-00 13020-00 13000-00
13	3-Φ Auto Transformer	1	Hi-Q Electronics	11,100-00	11,100-00
14	Volt Ratio Box (0-750)V	1	OSAW	5,500-00	5,560-00
15	Current Shunt (0.1Ω-15A)	1	OSAW	2,875-00	2,875-00
16	Battery (2V/200mA)	1	Itta Electronics	1,800-00	1,800-00
17	Standard Cell (1.0186V)	1	OSAW	3,110-00	3,110-00
18	Fixed DC Power Supply Variable DC Power Supply Fixed DC Supply Variable DC Power Supply Fixed DC Supply	1 1 2 1 1	Scientific Enterprises Scientific Enterprises Valika Electronics Lokesh Electro Tech. Lokesh Electro Tech.	1,075-00 2,053-00 2,650-00 7,840-00 2,499-00	1,075-50 2,053-50 5,300-00 7,840-00 2,499-00
19	1-Φ Power Factor Meter 1-Φ Power Factor Meter	1 1	Associate Agencies Valika Electronics	2,750-00 6,800-00	2,750-00 6,800-00
20	DC Galvanometers	3 2 4 5	Associate Agencies OSAW Valika Electronics Lokesh Electro Tech.	555-00 1632-00 950-00 784-00	1,665-00 3,263-00 3,800-00 3,920-00
21	1-Φ Energy Meter 230V, 5A	1	Hi-Q Electronics	2,000-00	6,000-00
22	Resistance Coils (4 Terminals)	3	Itta Electronics	473-00	1,419-00

S.No	Name of the equipment	Qty.	Make/Supplier	Cost/Unit (Rs)	Total Cost (Rs)
23	Wattmeters (150-300-500-600-750)V, 10 A, LPF	1 1 2	Hi-Q Electronics Itta Electronics Valika Electronics	4,100-00 4,340-00 5,313-00	4,100-00 4,340-00 10,626-00
24	Wattmeters (75-150-300)V, 10A, UPF	1 2	Associate Agencies Asian Engineering	1,625-00 1,965-00	1,625-00 3,930-00
25	Rheostats 25Ω/5A 145Ω/2.8A 145Ω/2.8A 25Ω/5A 25Ω/5A	2 1 2 1 1	Associate Engineer Associate Engineer Itta Electronics Energy Electricals Engg. Valika Electronics	975-00 975-00 3,161-00 1,990-00 5,200-00	1,950-00 975-00 6,322-50 1,990-00 5,200-00
26	AC Volt Meters (0-150-300-600)V MI	4 1 4 4	Associate Agencies Itta Electronics Hi-Q Electronics Valika Electronics	1,060-00 1,270-00 1,085-00 1,950-00	4,240-00 1,270-00 4,340-00 5,850-00
27	DC Volt Meter (0-30-60V)	1	Associate Agencies	1,100-00	1,100-00
28	DC Ammeter (0-2)A mc	1	Hi-Q Electronics	1,000-00	1,000-00
29	D' Arsonal Galvanometer	1	Hi-Q Electronics	11,180-00	11,180-00
30	AC Ammeters (0-2)A MI (0-10)A MI (0-10)A MI (0-2)A MI (0-10)A MI (0-2)A MI	3 1 3 2 2 2	Associate Agencies Associate Agencies Itta Electronics Valika Electronics Valika Electronics Lokesh Electro Tech.	1,040-00 1,040-00 1,205-00 1,950-00 1,950-00 1,568-00	3,120-00 1,040-00 3,615-00 3,900-00 3,900-00 3,136-00
31	5 kVA Voltage Stabilizer	1	Valika Electronics	10,500-00	10,500-00
32	3-Φ Power Factor meter	1	Hi-Q Electronic Systems	3,980-00	3,980-00
33	Head Phones for AC Bridges Head Phones for AC Bridges	5 5	Valika Electronics Lokesh Electro Tech.	1,150-00 1,078-00	5,750-00 5,390-00
34	Megger (500V, 500MΩ)	1	Lokesh Electro Tech.	8,820-00	8,820-00
35	Bridge Oscillator (1kHz)	1	Lokesh Electro Tech.	3,332-00	3,332-00

S.No	Name of the equipment	Qty.	Make/Supplier	Cost/Unit (Rs)	Total Cost (Rs)
36	Digital Storage Oscilloscope	1	Power Lab Instruments	31,050-00	31,050-00
37	Function Generator	1	Power Lab Instruments	18,000-00	18,000-00
38	Lenovo Desktops	2	AIT Solutions	23,667-00	47,334-00
39	Total Iron Racks Setup	-	Technico	-	3,56,962-00
40	Insulation Mats	7	Vardhman Hoses Pvt. Ltd.	938-00	8985-00
			Total Cost	**9,44,832-00**	

List of Experiments

1. Measurement of resistance using Wheatstone bridge and Kelvin‘s Double Bridge.
2. Measurement of inductance using Anderson bridge and capacitance using Schering Bridge.
3. Calibration of single-phase energy meter.
4. Calibration of watt meter using Phantom loading.
5. Measurement of power using 3-Voltmeter and 3-Ammeter method.
6. Measurement of reactive power in a three-phase circuit.
7. Extension of range of given Ammeter and Voltmeter.
8. Measurement of displacement using LVDT.
9. Measurement of different ranges of temperatures using i) RTD ii) Thermocouple
10. Measurement of strain with the help of strain gauge transducers.
11. Calibration of dynamometer type power factor meter.
12. Measurement of Insulation resistance using Megger.
13. Measurement of three phase active power using simulation.
14. Simulation of Maxwell’s bridge and De-Sauty’s bridge.
15. Study of CRO: Measurement of amplitude, time period, frequency and phase shift using Lissajous patterns.
16. Download of one-cycle data of a periodic waveform from a DSO and use values to compute the RMS value.

List of Experiments Beyond Syllabus/Out of Box Experiments

1. Measurement of parameters of a choke coil using 3-Voltmeter and 3-Ammeter method.
2. Simulation of Owen's bridge.

Scope of Research in Electrical Measurements Lab

The Electrical Measurements Lab provides ample scope for research in both classical measurement techniques and modern instrumentation. Using bridge circuits, students can explore high-accuracy methods for resistance, inductance, and capacitance measurement, while calibration setups enable studies on improving precision of energy meters, wattmeters, and power factor meters. Power and energy measurement experiments open research opportunities in error reduction, low power factor studies, and renewable energy applications. Insulation testing with Megger extends research into reliability and diagnostics of electrical equipment. DSOs allow advanced waveform analysis, harmonic studies, and power quality monitoring, while simulation-based experiments enable virtual instrumentation and digital twin development.