ANNAMACHARYA

(ESTD UNDER AP PRIVATE UNIVERSITIES (ESTABLISHMENT AND REGULATION) ACT, 2016)

(UNIVERSITY LISTED IN UGC AS PER THE SECTION 2(f) OF THE UGC ACT, 1956)

RAJAMPET, Annamayya District, AP – 516126,

Department of Electrical and Electronics Engineering

Power systems lab





Description of Lab

The Power Systems Lab is designed to provide students with hands-on experience in analyzing, testing, and understanding the performance of power system components. The laboratory experiments focus on:

* Testing the characteristics of various types of protective relays.
* Evaluating the performance of transmission lines under different operating conditions.
* Understanding machine parameters through experimental analysis of induction motors, synchronous machines, and transformers.
* Demonstrating the working and performance of renewable energy systems such as solar and wind.
* Exposing students to practical fault analysis and feeder studies to bridge theoretical knowledge with real-world applications.

The lab aims to enhance the practical knowledge of students in protection, transmission, distribution, renewable integration, and system stability—key areas in modern power systems.

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RAJAMPET, Annamayya District, AP – 516126,

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

POWER SYSTEMS LABORATORY

Location: Room No: PG-106

INFORMATION ABOUT THE EQUIPMENT

S.No	ITEM DESCRIPTION	LOCATION DEPARTMENT	VALUE (in Rs)	QUANTITY	Date of purchase
1	**Over Current Relay** AUX.source:230Vac, DC:24 V , CT rating:1A	EEE DEPARTMENT POWER SYSTEMS LAB	83,000	1	10/03/11
2	**Static Negative Phase Sequence Current Relay Unit** Current rating:1A/5A AUX.source:230Vac	EEE DEPARTMENT POWER SYSTEMS LAB	94,000	1	10/03/11
3	**Electro mechanical Over Voltage Relay Unit** AUX.Voltage:110V, 50 HZ Vdc:24V	EEE DEPARTMENT POWER SYSTEMS LAB	91000	1	10/03/11
4	**Equivalent Circuit Of A Three Winding Transformer** Out Put:2 KVA, Primary Voltage:220 V, Secondary Voltage:110V.Tertiary Voltage:63.5 V	EEE DEPARTMENT POWER SYSTEMS LAB	1,65,000	1	10/03/11
5	**Static Biased Differential Relay Unit** AC (I_n):1A/5A**,** Vdc:24V	EEE DEPARTMENT POWER SYSTEMS LAB	1,10,000	1	10/03/11
6	**Microprocessor Based Over Voltage/ Under Voltage Relay** Voltage V_n=110/240/415 V AC AUX. power supply:24V to 110 V AC/DC	EEE DEPARTMENT POWER SYSTEMS LAB	98,800	1	10/03/11

	95V to 240 V AC/DC				
7	**Voltage Stabilizer** 1-Phase.10kVA	EEE DEPARTMENT POWER SYSTEMS LAB	18,500	1	13/08/13
8	**Three phase transmission line simulator,**415, 5A	EEE DEPARTMENT POWER SYSTEMS LAB	1,65000	1	29/03/21
9	**Radial distribution feeder** DC12V,15A	EEE DEPARTMENT POWER SYSTEMS LAB	6,60,000	1	14/02/21
10.	**Three phase fault analysis kit,** 415v, 5A	EEE DEPARTMENT POWER SYSTEMS LAB	1,52,000	1	14/02/21

Total cost (Rs) 10,43,300-00

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Title of the Course	Power Systems Lab
Category	PCC
Couse Code	20A264L
Year	III
Semester	VI
Branch	EEE

Lecture Hours	Tutorial Hours	Practical	Credits
-	-	3	1.5

Course Objectives:

- To analyze the performance relay of operation
- To demonstrate the Performance of Transmission lines
- To analyze the performance of AC machines
- To demonstrate the performance of Renewable Energy sources

List of Experiments

Perform any ten experiments out of the following

1. Characteristics of IDMT Over Current Relay (Electromagnetic Type).
2. Characteristics of Negative Phase Sequence Relay (Static Type).
3. Characteristics of Percentage biased differential Relay (static type).
4. Characteristics of Over Voltage Relay (Electromagnetic Type).
5. Characteristics of overvoltage / under voltage relay (Microprocessor Based Type).
6. Characteristics of Percentage Biased Differential Relay (Electromagnetic Type).
7. Determination of ABCD parameters of transmission lines.
8. Determination of regulation and efficiency of a transmission line
9. Ferranti effect
10. Separation of No-Load Losses of Three Phase Squirrel Cage Induction motor.
11. Equivalent Circuit of three winding transformer.
12. Power Angle Characteristics of Salient pole Synchronous machine.
13. Determination of Sub transient Reactance of Salient pole Synchronous Machine.
14. Study of Radial distribution Feeder
15. Study of Time Grading
16. Determination of Sequence Impendence of Three phase alternator.
17. L-G, L-L, L-L-G Fault Analysis of a three phase alternator.
18. Study of effect of solar panels connected In (i) series (ii) parallel (iii) series-parallel
19. Wind Speed measurement.

Web Resources:

https://vp-dei.vlabs.ac.in/Dreamweaver/

Course Outcomes:

At the end of the course, the student will be able to	Blooms Level of Learning
1. Analyze the performance relay of operation	L2
2. Demonstrate the Performance of Transmission lines	L2
3. Analyze the performance of AC machines	L4
4. Demonstrate the performance of Renewable Energy sources	L4

CO-PO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	-	-	3	-	3	3	3	3
CO2	3	3	3	3	2	3	-	-	3	-	3	3	3	3
CO3	3	3	3	3	2	3	-	-	3	-	3	3	3	3
CO4	3	3	3	3	3	-	-	-	3	-	3	3	2	2

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List of Experiments Beyond Syllabus

1. Characteristics of Distance Relay (Static & Numerical).
2. Determination of Voltage Stability Margin using PV and QV curves.
3. Experimental study on STATCOM / SVC for voltage regulation.
4. Measurement of Earth Resistance using Fall-of-Potential method.
5. Performance of Microgrid with Solar-Wind Hybrid Integration.
6. Determination of Harmonic Distortion in power system using FFT analyzer.
7. Load Flow Analysis using Software (MATLAB/ETAP/DigSILENT).

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Out of Box Experiments

1. Smart Energy Metering using IoT.
2. Real-time simulation of faults using hardware-in-the-loop (HIL) setup.
3. Grid synchronization of solar PV inverter.
4. Study of Electric Vehicle (EV) charging impact on distribution system.
5. Condition monitoring of transformers using DGA (Dissolved Gas Analysis) data (case study-based).
6. Adaptive Protection Scheme using microprocessor-based relays.
7. Energy Management in Smart Homes using IoT-controlled devices.

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Scope of research

The Power Systems Lab provides a strong foundation for applied research in power system operation, protection, and renewable integration. Potential research areas include:

Power System Protection & Smart Grids:
* Development of adaptive and self-healing protection schemes.
* Artificial Intelligence (AI) based relay coordination.

Renewable Energy Integration:
* Optimal placement of solar PV and wind systems in distribution networks.
* Microgrid operation, control, and energy management.

Power Quality and Reliability:
* Harmonic mitigation using active filters.
* Reliability assessment of distribution feeders.

Electric Vehicles & Mobility:
* Impact of EV charging stations on grid stability.
* Vehicle-to-Grid (V2G) technologies.

Emerging Technologies:
* IoT and Machine Learning applications in smart energy systems.
* Real-time monitoring of power system health using sensors and data analytics.