



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

POWER SYSTEM SIMULATION LABORATORY								
VII Semester: EEE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEEC45	Core	0	0	3	1.5	30	70	100
Contact Classes: Nil		Tutorial Classes: Nil		Practical Classes: 36		Total Classes:36		
Prerequisite: Power System Analysis								
I. COURSE OVERVIEW:								
Power System simulation Laboratory comprises of protection, simulation, high voltage and machine related experiments. Varieties of Power system Simulation packages like Load flow, PSCAD and MATLAB are available.								
II. COURSE OBJECTIVES:								
The students will try to learn:								
I. Simulate transmission lines using PSCAD software to analyze faults in transmission system								
II. The load flow studies using static load flow methods using MATLAB.								
III. The transient state stability in power systems.								
III. COURSE SYLLABUS:								
Week – 1: FORMATION OF BUS ADMITTANCE AND IMPEDANCE MATRICES								
Formation of bus admittance matrices by adding one element at a time and also write a program for Zbus building algorithm using MATLAB.								
Week – 2: LOAD FLOW SOLUTION USING GAUSS SEIDEL METHOD								
Write a MATLAB program for load flow studies without and with generator buses using Gauss Seidel Method.								
Week – 3: LOAD FLOW SOLUTION USING NEWTON RAPHSON AND FDLF METHOD								
Write a MATLAB program for load flow studies using Newton Raphson and Fast decoupled load flow (FDLF) method								
Week – 4: POWER SYSTEM FAULT ANALYSIS								
Analysis of symmetrical and unsymmetrical faults using symmetrical components using MATLAB.								
Week – 5: POINT BY POINT METHOD								
Development of MATLAB program for transient stability analysis of single machine, infinite bus and multi machine system by point by point method.								
Week – 6: TRANSIENT RESPONSE OF RLC CIRCUIT								
Obtain transient response of RLC circuit using PSCAD.								
Week – 7: THREE PHASE SHORT CIRCUIT ANALYSIS IN A SYNCHRONOUS MACHINE								
Analyze symmetrical faults and short circuit studies in a given synchronous machine using PSCAD.								
Week – 8: STUDY OF TRANSMISSION SYSTEM AND SHORT CIRCUIT ANALYSIS OF 9 BUS SYSTEM								
Study of simple transmission system and also Perform short circuit analysis on IEEE 9 bus system using PSCAD.								
Week – 9: TRANSFORMER INRUSH CURRENT								
Determination of transformer inrush current under unbalanced three phase parameters using PSCAD.								

Week – 10: SMALL SIGNAL STABILITY ANALYSIS

Development of PSCAD / MATLAB model for stability analysis of single machine - infinite bus with STATCOM.

Week – 11: TRANSMISSION LINE PARAMETERS

Obtaining parameters of a typical transmission line and modelling it in PSCAD.

Week – 12: LOAD FREQUENCY CONTROL

Obtain the frequency response of single and two area power system using PSCAD/MATLAB

Week – 13: POWER QUALITY

Familiarization with PSCAD and understanding of reactive power and power factor correction in AC circuits, current harmonics drawn by power electronics interface.

- Using the Network harmonic Impedance component
- Identifying network resonances
- Harmonic voltage amplification due to non linear loads

Week – 14: DISTANCE PROTECTION

Development of PSCAD model to study the distance protection scheme in long transmission line.

IV. REFERENCE BOOKS:

1. M A Pai, "Computer Techniques in Power System Analysis", TMH Publications, 1st Edition, 2010
2. Grainger, Stevenson, "Power System Analysis", Tata McGraw-Hill, 1st Edition, 2010.
3. Badri Ram and D N Vishwakarma, "Power System Protection and Switchgear", Tata McGraw-Hill Publication company limited, 1st Edition, 1995.
4. Paithankar, S R Bhide, "Fundamentals of Power System Protection", PHI, 1st Edition, 2003.
5. C L Wadhwa, "Electrical Power Systems", New Age international (P) Limited, 6th Edition, 2010.

V. WEB REFERENCES:

1. <https://www.ee.iitkgp.ac.in>
2. [https://www.iare.ac.in /](https://www.iare.ac.in/)