POWER SYSTEM COMPUTER AIDED DESIGN LABORATORY

VII Semester: EEE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEE113	Core	-	-	3	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 42				Total Classes: 42		

I. COURSE OVERVIEWS:

The power system simulation laboratory introduces the program skills using PSCAD and MATLAB through experiments. This laboratory gives emphasis on single line diagram, load flow anlayis, differentpower protection schemes, fault analysis and various power quality issues using simulation. PSCAD provides key building custom models in any electrical engineering related applications.

II. OBJECTIVES:

The course should enable the students to:

I. Simulate transmission lines using PSCAD software to analyze faults in transmission system.
II. Demonstrate load flow studies using static load flow methods using MATLAB.
III. Analyze transient state stability in power systems.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Demonstrate** the programming concepts of simulation tools for obtaining parameters of a typical transmission line and modelling	Understand
CO 2	**Illustrate** the formation of bus admittance matrices by adding one element at a time for load flow studies	Understand
CO 3	**Interpret** the symmetrical and unsymmetrical faults for transmission linesusing digital simulation	Understand
CO 4	**Evaluate** the transient response using numerical methods in RLC circuit and infinite bus systems	Evaluate
CO 5	**Analyze** the transformer inrush current for unbalanced three phaseparameters	Analyze

IV. SYLLABUS:

LIST OF EXPERIMENTS

Expt. 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.

Expt. 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.

Expt. 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.

Expt. 4	**POWER SYSTEM FAULT ANALYSIS**
Analysis of symmetrical and unsymmetrical faults using symmetrical components using MATLAB.	
Expt. 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.	
Expt. 6	**TRANSIENT RESPONSE OF RLC CIRCUIT**
Obtain transient response of RLC circuit using PSCAD.	
Expt. 7	**THREE PHASE SHORT CIRCUIT ANALYSIS IN A SYNCHRONOUS MACHINE**
Analyze symmetrical faults and short circuit studies in a given synchronous machine using PSCAD.	
Expt. 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.	
Expt. 9	**TRANSFORMER INRUSH CURRENT**
Determination of transformer inrush current under unbalanced three phase parameters using PSCAD.	
Expt. 10	**SMALL SIGNAL STABILITY ANALYSIS**
Development of PSCAD model for stability analysis of single machine - infinite bus with STATCOM.	
Expt. 11	**TRANSMISSION LINE PARAMETERS**
Obtaining parameters of a typical transmission line and modelling it in PSCAD.	
Expt. 12	**LOAD FREQUENCY CONTROL**
Obtain the frequency response of single and two area power system using PSCAD.	
Expt. 13	**POWER QUALITY**
Familiarization with PSCAD and Understanding of a) Reactive power and power factor correction in AC circuits. b) Current harmonics drawn by power electronics interface	
Expt. 14	**DISTANCE PROTECTION**
Development of PSCAD model to study the distance protection scheme in long transmission line.	
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, First 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, 6rd Edition, 2010.

Web References:

1. https://www.ee.iitkgp.ac.in
2. https://www.iare.ac.in

LIST OF EQUIPMENT REQUIRED FOR A BATCH OF 36 STUDENTS:

SOFTWARE: Power System Computer Aided Design (PSCAD) software and MATLAB

HARDWARE: 36 No. of Desktop Computers