SCHEME OF COURSE WORK (2014-2015)

COURSE DETAILS:

Course Title	Power system analysis
Course Code	13EE1126
Program	B.Tech
Branch	Electrical & Electronics Engineering
Semester	VII
Prerequisites	Network analysis and power transmission engineering
Course to which it is prerequisite	All Advanced Courses In Electrical Engineering

COURSE OUTCOMES:

1	Calculate Z bus, Y bus for a power system network by singular transformation method
2	Analyze the solutions for power system network by Gauss siedal, Newton-Raphson , and Decoupled load flow methods, Fast decoupled load flow method.
3	Explain the concepts of symmetrical component theory and analyze symmetrical faults and unsymmetrical faults
4	Discuss the concepts on steady state stability and methods to improve
5	Explain the concepts on Transient state stability, solution to swing equation, and discuss methods to improve transient state stability

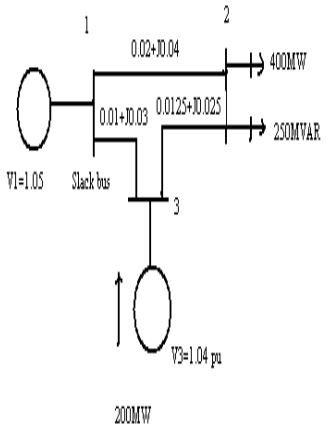
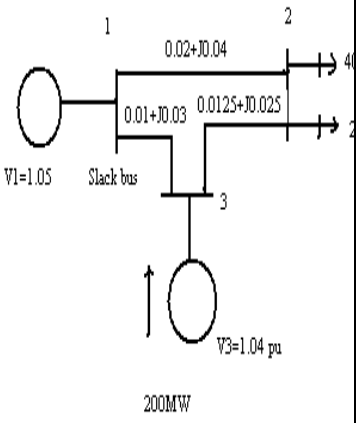
COURSE OUTCOME/PROGRAM OUTCOMES:

CO/PO	1	2	3	4	5	6	7	8	9	10	11	12
CO-1	M	M	S	M			M		M			M
CO-2	M	M	S	M			M		M			M
CO-3	M	M	S	M			M		M			M
CO-4	M	M	S	M			M		M			M
CO-5	M	M	S	M			M		M			M

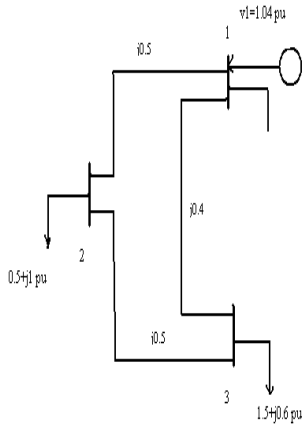
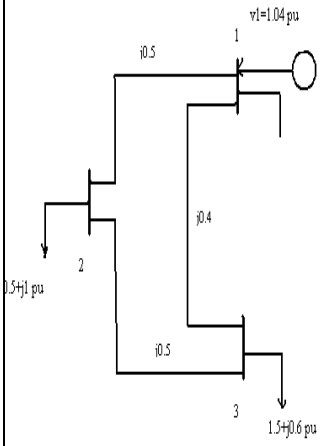
Assessment Methods	Assignments/Quiz/Mid Exam/Seminar/Viva-Voce/End Exam

TEACHING LEARNING AND EVALUATION

Week	Topic/content	Course outcomes	Sample questions	Teaching-learning stategy	Assesment method & schedule
1	**Unit-I POWER SYSTEM NETWORK MATRICES: :** Graph Theory: Definitions, Bus Incidence Matrix, Ybus formation by Direct and Singular Transformation Methods, Numerical Problems. Formation of ZBus:	CO-1	1). Define oriented graph with suitable example and find Incidence matrix for the same. 2).What are the advantages of Ybus in load flow studies	Lecture/discussion	Assignment-1 & quiz-1
Week-2	Partial network, Algorithm for the Modification of Z Bus Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of	CO-1	1). Obtain Z bus when the element added in between two existing buses 2). Below fig (1) show the one-line diagram of a simple 3 bus-power system with a generator at buses 1 and 3 the magnitude of voltage at bus 1 is adjusted to 1.05 pu. Voltage magnetic at bus 3 is fixed at 1.04 pu with a real power generation of 200 MW. A load consisting of 400 MW and 250 Mvar is	Lecture/discussion/problem solving	Assignment-1 & quiz-1

	element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems).- Modification of ZBus for the changes in network (Problems)		taken from bus 2. Line impedance are marked in per unit on a 100 Mva base, and the line charging suspectance are neglected. Obtain the power flow solution by the gauss – seidel method including line flows and line losses. (upto one iteration) 		
Week-3	**unit-II** POWER FLOW STUDIES :: Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static load flow equations – Load flow solutions using Gauss Seidel Method: Acceleration	CO-2	1). Explain N R method in rectangular co-ordinate method.. 	Lecture/discussion/problem solving	Assignment-1 & quiz-1

	Factor, Load flow solution with and without P-V buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses): Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages..				
Week-4	Newton Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Busses- Derivation of Jacobian	CO-2	A sample power system is shown in fig: 2. Determine V_2 and V_3 by N-R method (polar co-ordinates) up to 1 iteration. The values of the line impedance are shown in fig: 2	Lecture/discussion/problem solving	Assignment-1 & quiz-1

	Elements, Algorithm and Flowchart.				
Week-5	Decoupled and Fast Decoupled Methods.- Comparison of Different Methods – DC load Flow.	CO-2	1). A sample power system is shown in fig: 2. Determine V_2 and V_3 by fast decoupled method up to 1 iteration. The values of the line impedance are shown in fig: 2 	Lecture/discussion/problem solving	Assignment-1 & quiz-1
Week-6	**Unit-III SHORT CIRCUIT ANALYSIS :** Per-Unit System of Representation, Per-Unit equivalent reactance	CO-3	1). What are the advantages of per unit system. 2). Explain about symmetrical component theory	Lecture/discussion/problem solving	Assignment-1 & quiz-1

	network of a three phase Power System, Numerical Problems. Symmetrical fault Analysis: Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems.				
Week-7	Symmetrical Component Theory: Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances. Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.	CO-3	Draw positive, negative, and zero sequence networks for given power system.	Lecture/discussion/problem solving	Assignment-1 & quiz-1
Week-8	Unsymmetrical Fault Analysis: LG, LL, LLG faults with and	CO-3	Determine the fault current during a LG fault on the transmission line with and without	Lecture/discussion/problem solving	Assignment-1 & quiz-1

	without fault impedance, Numerical Problems..		impedance.		
Week-9	MID TEST-1	CO-1,CO-2,CO-3			
Week-10	problems	Co-3		Lecture/discussion/problem solving	Assignment-2 & quiz-2
Week-11	**UNIT-IV POWER SYSTEM STEADY STATE STABILITY ANALYSIS** : Elementary concepts of Steady State, Dynamic and Transient Stabilities. Description of Steady State Stability Power Limit, Transfer	CO-4	1)Distinguish between steady state and dynamic stabilities.	Lecture/discussion/problem solving	Assignment-2 & quiz-2
Week-12	Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to improve steady state stability,	CO-4	What are the steps to be taken for improving steady state stability limit.	Lecture/discussion/problem solving	Assignment-2 & quiz-2
Week-13	PROBLEMS	CO-4		Lecture/discussion/problem solving	Assignment-2 & quiz-2
Wee	**Unit-V**	CO-5		Lecture/discussion/pro	Assignme

k-14	**POWER SYSTEM TRANSIENT STATE STABILITY ANALYSIS**: : Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion,		How transient stability is determined by equal area criteria.	blem solving	nt-2 & quiz-2
Week-15	Application of Equal Area Criterion, Critical Clearing Angle Calculation.- Solution of Swing Equation:.	C0-5	Derive expression for critical clearing angle	Lecture/discussion/problem solving	Assignment-2 & quiz-2
Week-16	Point-byPoint Method. Methods to improve Stability	CO-5	Explain point by point method of analyzing stability.	Lecture/discussion/problem solving	Assignment-2 & quiz-2
Week-17	Application of Auto Reclosing and Fast Operating Circuit Breakers.		Determine the capacity of circuit breaker to be employed for a LLLG fault on the following network.	Lecture/discussion/problem solving	Assignment-2 & quiz-2
Week-18	MID Exam-2	CO-3,CO-4,CO-5			
Week-19,20	End Exam	All co's			External exam