POWER SYSTEMS-II

Course Code	19EE3701	**Year**	IV	**Semester**	I
Course Category	Program core	**Branch**	EEE	**Course Type**	Theory
Credits	3	**L-T-P**	3-0-0	**Prerequisites**	BEEE, PS-I
Continuous Internal Evaluation	30	**Semester End Evaluation**	70	**Total Marks**	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Understand the per unit representation, importance of power flow studies and fault studies
CO2	Analyze power flows and different types of faults in a power system
CO3	Investigate stability and load frequency control of power system
CO4	Solve the economic dispatch problem with and without losses

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3												1	
CO2	3	2											1	1
CO3	2			2		1							1	1
CO4	3	2											1	

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**Per unit Representation and Power Flow Studies** Single line diagram, per unit quantities, per unit impedance diagram of a power system, Y bus formation by direct inspection method. Necessity of power flow studies - Derivation of static load flow equations– Load flow solutions using Gauss Seidel Method, Newton Raphson method, Fast Decoupled methods - algorithm and flowchart, Comparison of Different methods of load flow, numerical Problems (max. 3-buses and one iteration only)	CO1 & CO2
II	**Short Circuit Analysis** Necessity of fault studies, Types of faults, symmetrical components - positive, negative and zero sequence components of voltage, current and impedance. Sequence Networks - LG, LL, LLG faults with and without fault impedance - numerical Problems	CO1 & CO2
III	**Stability Analysis** Concepts of steady state, dynamic and transient stabilities - transfer reactance, synchronizing power coefficient, power angle curve - determination of steady state stability and methods to improve steady state stability - Derivation of swing equation – Determination of transient stability by equal area criterion, application of equal area criterion to	CO3

	sudden change in mechanical input–derivation of critical clearing angle and critical clearing time - Methods to improve transient stability.	
IV	**Load Frequency Control** Modeling of speed governing system, turbine model, generator and load model - Automatic generation control of a single area system, steady state analysis, dynamic response, PI control of single area system - two area system, tie-line bias control.	CO3
V	**Economic Operation of Power Systems** Optimal operation of generators in thermal power stations, heat rate curve, cost curve, incremental fuel and production costs - Derivation of coordination equation for economic dispatch problem with and without losses - numerical Problems	CO4

Learning Resources
Text Books:
1. Modern power system analysis - D.P.Kothari and I.J.Nagrath - 4th edition - TMH publications 2. Power system analysis - HadiSaadat – 4th edition- TMH publications. 3. Power Generation, Operation, and Control - Wood and Wollenberg- 3rd edition - Wiley Publishers 4. Electric Energy systems Theory - O.I.Elgerd, 2nd edition - TMH Publishers
Reference Books:
1. Power System Analysis: Operation and Control - AbhijitChakrabarti, SunitaHalder – 3rd edition PHI Learning. 2. Power System Analysis and design - B.R.Gupta,- 4thEdition S.Chand Publishers. 3. Electrical Power Systems - Ashfaq Husain - 7thedition - CBS Publishers & Distributors.