

POWER SYSTEM ANALYSIS

Course Code	23EE3603	Year	III	Semester	II
Course Category	Professional Core	Branch	EEE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	ECA, PS-II
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 concepts of single line diagram, faults, load flow and stability studies of the power system (L2).
CO2	Apply per unit quantities to develop impedance diagrams and determine sequence components in power system networks (L3).
CO3	Analyze the symmetrical and unsymmetrical faults (L4).
CO4	Apply graph theory, power flow methods, and stability studies for the analysis of power system (L3).
CO5	Analyze the load flow solutions and stability of a power system (L4).
CO6	Submit a report on single line diagram, fault analysis, load flows and stability studies.

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														
CO2	3												2	1
CO3		3				1						1	2	1
CO4	3												2	1
CO5		3		3								1	2	1
CO6				3			1		3	3		2		

SYLLABUS		
Unit No.	Contents	Mapped CO
I	Per Unit Representation Per Unit Quantities–Single line diagram – Impedance diagram of a power system – Numerical Problems. Symmetrical Fault Analysis Reactance's of Synchronous Machine – Three Phase Short Circuit Currents - Short circuit MVA calculations for Power Systems – Numerical Problems.	CO1 CO2 CO3 CO6

II	Symmetrical Components Definition of symmetrical components – symmetrical components of unbalanced three phase systems – Power in symmetrical components – Sequence impedances and Sequence networks of Synchronous generator, Transformers and Transmission line-Numerical Problems. Unsymmetrical Fault analysis Various types of faults: LG– LL– LLG on unloaded alternator-Numerical problems.	CO1 CO2 CO3 CO6
III	Circuit Topology Graph theory definitions – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y_{bus} matrix by singular transformation and direct inspection methods. Z-Bus Algorithm Formation of Z_{bus} : Algorithm for the Modification of Z_{bus} Matrix (without mutual impedance) – Numerical Problems on 3-bus system only.	CO1 CO4 CO6
IV	Power Flow Studies Necessity of power flow studies – Derivation of static power flow equations – Power flow solution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) – Decoupled and Fast Decoupled methods – Algorithmic approach – Numerical Problems on 3-bus system only.	CO1 CO4 CO5 CO6
V	Power System Stability Analysis Elementary concepts of Steady state – Dynamic and Transient Stabilities – Swing equation – Steady state stability – Equal area criterion of stability – Applications of Equal area criterion – Factors affecting transient stability – Methods to improve steady state and transient stability – Numerical problems.	CO1 CO4 CO5 CO6

Learning Resources	
Text Books:	
1. Grainger and Stevenson, "Power System Analysis", Tata McGraw Hill.2003 2. I.J.Nagrath & D .P.Kothari, "Modern Power system Analysis", Tata McGraw–Hill Publishing Company - 3 rd edition - 2007.	
Reference Books:	
1. A.R.Bergen, "Power System Analysis", Prentice Hall - 2 nd edition -2009. 2. HadiSaadat, "Power System Analysis", Tata McGraw–Hill 3 rd edition -2010. 3. B.R.Gupta, "Power System Analysis", A H Wheeler Publishing Company Limited - 1998. 4. J.Duncan Glover, M.S.Sarma - T.J.Overbye, "Power System Analysis and Design", Cengage Learning publications - 5th edition - 2011.	
E-Resources:	
1. https://archive.nptel.ac.in/courses/117/105/117105140 2. https://archive.nptel.ac.in/courses/108/105/108105104	