

POWER SYSTEM ANALYSIS

VI Semester: EEE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
AEEB22	Core	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes: 45		Tutorial Classes: 15		Practical Classes: Nil			Total Classes: 60	
<p>OBJECTIVES: The Students Will Try To Learn:</p> <p>I The methods to build the bus impedance and bus admittance matrices for primitive and non-primitive networks.</p> <p>II The numerical methods for load flow analysis of n bus interconnected power system.</p> <p>III The theorems and techniques involved in the fault level calculations during balanced and unbalanced faults.</p> <p>IV The performance of power system under steady and transient state stability conditions.</p> <p>COURSE OUTCOMES: After successful completion of the course, Students will be able to:</p> <p>CO 1 Recall the basic terminology of graph theory for formation of bus impedance and admittance matrices.</p> <p>CO 2 Interpret the entries of bus impedance and admittance matrices using singular transformation method, step by step method to obtain primary data of load flow analysis.</p> <p>CO 3 Build the algorithms to form the bus impedance and admittance matrices for various configuration of primitive network.</p> <p>CO 4 Make use of Guass Siedel, Newton Raphson, Decoupled and Fast Decoupled methods to obtain the unknown electrical quantities at different buses of power system.</p> <p>CO 5 Demonstrate the power system in per unit method for converting all specifications of electrical components into same units.</p> <p>CO 6 Make use of Thevenin's theorem and sequence component theory for the analysis of power system under symmetrical and unsymmetrical faults.</p> <p>CO 7 Outline the conditions of power system to undergo steady state, dynamic or transient stabilities studies.</p> <p>CO 8 Illustrate the steady state and transient stability conditions of interconnected power system to obtain required specifications for normal operation.</p> <p>CO 9 Summarize the methods for improving steady state and transient stabilities to enhance the performance of power system.</p> <p>CO10 Analyze the load flow studies, fault analysis and stability of power system helps to structure switchgear protection considering real world constraints and work in team or individual to carry research work.</p>								
Module - I	POWER SYSTEM NETWORK MATRICES						Classes: 09	
<p>Graph Theory: Definitions, bus incidence matrix, Y bus formation by direct and singular transformation methods, numerical problems; Formation of Z Bus: Partial network, algorithm for the modification of Z bus matrix for addition of element from a new bus to reference bus, addition of element from a new bus to</p>								

an old bus, addition of element between an old bus to reference bus and addition of element between two old busses (Derivations and Numerical Problems), modification of Z bus for the changes in network (Numerical Problems).		
Module - II	POWER FLOW STUDIES AND LOAD FLOWS	Classes: 09
Load flows 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 factor, load flow solution with and without PV 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; Newton Raphson method in rectangular and polar coordinates form: Load flow solution with or without PV busses derivation of Jacobian elements, algorithm and flowchart, decoupled and fast decoupled methods, comparison of different methods, DC load flow study.		
Module – III	SHORT CIRCUIT ANALYSIS PER UNIT SYSTEM OF REPRESENTATION	Classes: 09
Per unit system: Equivalent reactance 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; 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; Unsymmetrical fault analysis: LG, LL, LLG faults with and without fault impedance, numerical problems.		
Module - IV	STEADY STATE STABILITY ANALYSIS	Classes: 09
Steady state stability: Elementary concepts of steady state, dynamic and transient stabilities, description of steady state stability power limit, transfer reactance, synchronizing power coefficient, power angle curve and determination of steady state stability and methods to improve steady state stability.		
Module - V	TRANSIENT STATE STABILITY ANALYSIS	Classes: 09
Swing equation: Derivation of swing equation, determination of transient stability by equal area criterion, application of equal area criterion, critical clearing angle calculation, solution of swing equation, point by point method, methods to improve stability, application of auto reclosing and fast operating circuit breakers.		
Text Books:		
<ol style="list-style-type: none"> 1. I J Nagrath & D P Kothari, “Modern Power system Analysis”, Tata McGraw-Hill Publishing Company, 2nd Edition. 2. M A Pai, “Computer Techniques in Power System Analysis”, TMH Publications. 3. B.R.Gupta, “ power system analysis and design”, S.CHAND publications 4. K Umarao, “Computer techniques and models in power systems”, I K International Pvt. Ltd. 		
Reference Books:		
<ol style="list-style-type: none"> 1. Stagg , El Abiad, “ Computer Methods In Power System”. Tata McGraw-Hill.1968. 2. Grainger and Stevenson, “Power System Analysis”, Tata McGraw-Hill, 3rd Edition, 2011. 3. J Duncan Glover and M S Sarma., THOMPSON, “Power System Analysis and Design”, 3rd Edition 2006. 4. Abhijit Chakrabarathi and Sunita Haldar, “Power system Analysis Operation and control”, 3rd Edition, PHI, 2010. 		
Web References:		
<ol style="list-style-type: none"> 1. https://www.worldcat.org/title/computer-methods-in-power-system-analysis/.../600788826 2. https://www.sjbit.edu.in/.../COMPUTER%20%20TECHNIQUES%20IN%20POWER%20%20SYS.. 3. https://www.books.google.com › Technology & Engineering › Electrical 4. https://www.nptel.ac.in/courses/108105067/ 5. https://www.jntusyllabus.blogspot.com/2012/01/computer-methods-power-systems-syllabus.html 		

E-Text Books:

1. <https://www.scribd.com/.../Computer-Methods-in-Power-System-Analysis-by-G-W-St...>
2. https://www.academia.edu/8352160/Computer_Methods_and_Power_System_Analysis_Stagg
3. <https://www.uploady.com#!/download/ddC9obmVTiv/NwO1AnQrlmogeJjS>
4. https://www.materialdownload.in/article/Computer-Methods-in-Power-System-Analysis_159/
5. <https://www.ee.iitm.ac.in/2015/07/ee5253/>