III B.Tech – II Semester
(20EE6011) POWER SYSTEM ANALYSIS

Int. Marks	Ext. Marks	Total Marks		L	T	P	C
30	70	100		3	-	-	3

Pre-Requisites: Power Systems – II

Course Objectives :
- To develop impedance diagram (p.u), formation of Y_{bus} and Z_{bus}
- To study the different load flow methods.
- To study short circuit calculation for symmetrical faults
- To study the effect of unsymmetrical faults and their effects.
- To study the rotor angle stability of power systems.

UNIT-I: Per UNIT Representation & Network Topology
Per UNIT Quantities–Single line diagram– Impedance diagram of a power system–Graphtheory definition – Formation of element node incidence and bus incidence matrices –Primitive network representation – Formation of Y–bus matrix by singular transformation and direct inspection methods - Formation of Z_{bus}: Algorithm for the Modification of Z_{bus} Matrix (without mutual impedance).

UNIT-II: Power Flow Studies
Necessity of power flow studies – Derivation of static power flow equations – Power flowsolution using Gauss-Seidel Method – Newton Raphson Method (Rectangular and polarcoordinates form) –Decoupled and Fast Decoupled methods – Algorithmic approach –Problems on 3–bus system only.

UNIT-III: Symmetrical Fault Analysis
Transients on a Transmission line-Short circuit of synchronous machine(on no-load) – 3– Phase short circuit currents and reactances of synchronous machine–Short circuit MVAcalculations -Series reactors – selection of reactors.

UNIT-IV: Symmetrical Components & Fault analysis
Definition of symmetrical components - symmetrical components of unbalanced three phasesystems – Power in symmetrical components – Sequence impedances – Synchronousgenerator – Transmission line and transformers – Sequence networks –Various types of faultsLG– LL– LLG and LLL on unloaded alternator–unsymmetrical faults on power system.

UNIT-V: Power System Stability Analysis
Elementary concepts of Steady state– Dynamic and Transient Stabilities– Description ofSteady State Stability Power Limit–Transfer Reactance–Synchronizing Power Coefficient –Power Angle Curve and Determination of Steady State Stability –Derivation of SwingEquation–Determination of Transient Stability by Equal Area Criterion–Applications ofEqual Area Criterion–Methods to improve steady state and transient stability.

Course Outcomes:

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

S.No	Course Outcome	BTL
1.	Able to evaluate the per UNIT quantities and to form Y_{bus} and Z_{bus} for a power system networks.	L6
2.	Able to analyze the load flow solution of a power system using different methods.	L4
3.	Able to determine the fault currents for various faults to design the protecting devices.	L3
4.	Able to find the sequence components of currents for unbalanced power system network.	L2
5.	Able to analyze the steady state, transient and dynamic stability concepts of a power system.	L4

Correlation of COs with POs& PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3			2								3	2
CO2	3	3	3	2	3								3	3
CO3	3	3	1	1									3	2
CO4	3	2	1	1									3	2
CO5	3	2	1	1	2								3	2

Text Books:

1. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
2. Modern Power system Analysis – by I. J. Nagrath& D. P. Kothari: Tata McGraw–Hill Publishing Company, 2nd edition.

Reference Books:

1. Power System Analysis – by A. R. Bergen, Prentice Hall, Inc.
2. Power System Analysis by Hadi Saadat – TMH Edition.
3. Power System Analysis by B. R. Gupta, Wheeler Publications.
4. Power System Analysis and Design by J. Duncan Glover, M. S. Sarma, T. J. Overbye Cengage Learning publications.