POWER SYSTEMS ANALYSIS

Course Code	20EE3603	Year	III	Semester	II
Course Category	Professional core	Branch	EEE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	EPG T&D
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 single line diagram of the power system, types of faults, different load flow techniques and stability. **(L2)**
CO2	**Apply** the knowledge of per unit quantities and impedance diagram to calculate the fault current.**(L3)**
CO3	**Apply** iterative techniques for load flow analysis**.(L3)**
CO4	**Analyze**various load flow techniques and Power system Stability**(L4)**
CO5	**Analyze**symmetrical and unsymmetrical faults that occur in a power system.**(L4)**
CO6	**Submit a report on** per unit quantities, faults occurring in power system, load flow studies and power system stability.

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	2	1
CO4		3		3				1					2	1
CO5		3				1							2	1
CO6					1		1		3	3	1			

SYLLABUS		
Unit No.	**Contents**	**Mapped CO**
I	**Per unit Representation** Single line diagram, per unit quantities, per unit impedance diagram of a power system, Symmetrical fault analysis: Short circuit current and MVA calculations, fault levels, application of series reactors, Numerical problems.	**CO1 CO2 CO5 CO6**
II	**Power Flow Studies-I** Y bus formation by direct inspection method. 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, algorithm and flowchart, Numerical Problems (max. 3-buses and one iteration only), DC load Flow.	**CO1 CO3 CO4 CO6**

III	**Power Flow Studies-II** Newton Raphson method in polar co-ordinates form, Derivation of Jacobian elements, algorithm and flowchart, Numerical Problems (max. 3-buses and one iteration only).	**CO1** **CO3** **CO4** **CO6**
IV	**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-positive, negative and zero sequence networks,Unsymmetrical fault analysis-LG, LL, LLG faults with and without fault impedance - Numerical Problems.	**CO1** **CO2** **CO5** **CO6**
V	**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 - equal area criterion to sudden change in mechanical input,effect of clearing time on stability - Methods to improve transient stability, Numerical Problems.	**CO1** **CO4** **CO6**

Learning Resources
Text Books:
1. D.P.Kothari and I.J.Nagrath, Modern power system analysis, MH publications, 4th Edition, 2011. 2. J.J.Grainger & W.D.Stevenson. Gary W. Chang, Power system analysis, MH publications, 2016.
Reference Books:
1. T.K.Nagsarkar M.S.Sukhija,Power System Analysis, OXFORD press, 2nd Edition,2016 2. A.R.Bergen, Power System Analysis, Prentice Hall, India, 2nd Edition, 2002. 3. J Duncan Glover, M.S.Sarma, T.J.Overbye, Power System Analysis and design, Cengage Learning Publications, 5th Edition, 2011. 4. Hadi Saadat, Power system analysis, MH publications, 2nd Edition, 2009.
E-Resources: https://archive.nptel.ac.in/courses/108/105/108105067/ https://archive.nptel.ac.in/courses/108/104/108104051/