SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Electrical and Electronics Engineering		LP: EE18501 Rev. No: 00 Date: 19/06/2020
B.E/~~B.Tech/M.E/M.Tech~~ : EEE	Regulation: 2018	
PG Specialisation : --		
Sub. Code / Sub. Name : EE18501 POWER SYSTEM ANALYSIS		
Unit : I – INTRODUCTION		

Unit Syllabus: Electric industry structure – Vertically integrated structure – Introduction to restructuring - Single line representation – Per phase and per unit analysis – Synchronous machine - transformer – transmission line and load modeling for different power system studies - Primitive network - Construction of bus admittance (Y-bus) matrix using inspection and singular transformation methods.

Objective: To develop power system models under steady state conditions.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Subject introduction, Electric industry structure and Vertically integrated structure	1, 5, 7	PPT
2	Basic components of a power system, Introduction to restructuring; Deregulation and Opportunities for Industrial Customers	5, 3, IEEE paper	PPT
3	Single line diagram, per phase and per unit analysis	1, 4	PPT
4	Numerical examples in per unit analysis	1, 4	PPT
5	Generator and transformer representation for different power system studies	1, 2	PPT
6	Transmission line and load representation for different power system studies	1, 2	PPT
7	Construction of Y-bus using inspection method, numerical examples	2, 4	PPT
8	Construction of Y-bus using singular transformation method	1	PPT
9	Numerical examples in Y-bus formation using singular transformation method	1	PPT
10	Numerical examples in per unit analysis	1, 4	PPT
11	Numerical examples in Y-bus formation	1, 4	PPT
12.	Tutorial	1, 4	PPT

Content beyond syllabus covered (if any): Deregulation and Opportunities for Industrial Customers

* Session duration: 50 minutes

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Sub. Code / Sub. Name: EE18501 POWER SYSTEM ANALYSIS

Unit : II - POWER FLOW ANALYSIS

Unit Syllabus: Importance of power flow analysis in planning and operation of power systems - statement of power flow problem - classification of buses - development of power flow model in complex variables form - iterative solution using Gauss-Seidel method - Q-limit check for voltage controlled buses - power flow model in polar form - iterative solution using Newton-Raphson method - iterative solution using Fast Decoupled method - Comparison of various power flow iterative solution methods

Objective: To apply iterative solution methods to solve power flow problems.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Importance of power flow analysis in planning and operation of power systems, statement of power flow problem, classification of buses	4, 6, 8	PPT
2	Development of power flow model in complex variables form	4, 6	PPT
3	Iterative solution using Gauss-Seidel method - Q-limit check for voltage controlled buses	1, 4, 6	PPT
4	Numerical examples in Gauss-Seidel method	1, 4, 6	PPT
5	Power flow model in polar form	1, 4, 6	PPT
6	Iterative solution using Newton-Raphson method	1, 4, 6	PPT
7	Numerical examples in Newton-Raphson method	1, 4, 6	PPT
8	Iterative solution using Fast Decoupled method	3	PPT
9	Comparison of various power flow iterative solution methods	3	PPT
10	Numerical examples in Gauss-Seidel method	1, 4, 6	PPT
11	Numerical examples in Newton-Raphson method	1, 4, 6	PPT
12	Numerical examples in Fast Decoupled method	1, 4, 6	PPT
13	Tutorial	1, 4, 6	PPT

Content beyond syllabus covered (if any): --

* Session ...

Sub. Code / Sub. Name: EE18501 POWER SYSTEM ANALYSIS

Unit : III - BALANCED FAULT ANALYSIS

Unit Syllabus : Importance of short circuit analysis - assumptions in fault analysis - analysis using Thevenin's theorem - Z-bus building algorithm - fault analysis using Z-bus – computations of short circuit capacity, post fault voltage and currents – significance of current limiting reactors in fault analysis

Objective: To model and analyze the power system under balanced fault conditions.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Importance of short circuit analysis, assumptions in fault analysis	2, 6, 9	PPT
2	Introduction to computations of short circuit capacity, post fault voltage and currents; Statistical Fault Analysis	2, 6, 9, IEEE paper	PPT
3	Fault analysis using Thevenin's theorem	4, 6	PPT
4	Numerical example in fault analysis using Thevenin's theorem	4, 6	PPT
5	Z-bus building algorithm	1, 4, 6	PPT
6	Numerical examples using Z-bus building algorithm	1, 4, 6	PPT
7	Fault analysis using Z-bus	1, 4, 6	PPT
8	Numerical examples in fault analysis using Z-bus	1, 4, 6	PPT
9	Significance of current limiting reactors in fault analysis	1, 4	PPT
10	Numerical examples in fault analysis using Thevenin's theorem	1, 4, 6	PPT
11	Numerical examples in fault analysis using Z-bus	1, 4, 6	PPT
12	Tutorial	1, 4, 6	PPT

Content beyond syllabus covered (if any): Statistical Fault Analysis

* Session duration: 50 mins

Sub. Code / Sub. Name: EE18501 POWER SYSTEM ANALYSIS

Unit : IV - UNBALANCED FAULT ANALYSIS

Unit Syllabus : Introduction to symmetrical components – sequence impedances – sequence circuits of synchronous machine, transformer and transmission lines - sequence networks analysis of single line to ground, line to line and double line to ground faults using Thevenin's theorem and Z-bus matrix- Open conductor fault
Objective: To model and analyze the power system under unbalanced fault conditions.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Introduction to symmetrical components, sequence impedances	2, 5	PPT
2	Sequence circuits of synchronous machine, transformer and transmission lines	2, 5	PPT
3	Sequence network analysis of single line to ground fault using Thevenin's theorem and Z-bus matrix	1, 2	PPT
4	Numerical examples	1, 2	PPT
5	Sequence networks analysis of line-to-line fault using Thevenin's theorem	1, 2, 4	PPT
6	Sequence networks analysis of line-to-line fault using Z-bus matrix	1, 2, 4	PPT
7	Numerical examples	1, 2, 4	PPT
8	Sequence networks analysis of double line to ground fault using Thevenin's theorem	1, 2, 4	PPT
9	Sequence networks analysis of double line to ground fault using Z-bus matrix	1, 2, 4	PPT
10	Numerical examples	1, 2, 4	PPT
11	Open conductor fault	2	PPT
12	Additional numerical examples in unbalanced fault analysis	1, 2, 4	PPT
13	Tutorial	1, 2, 4	PPT

Content beyond syllabus covered (if any): --

Sub. Code / Sub. Name: EE18501 POWER SYSTEM ANALYSIS

Unit : V - STABILITY ANALYSIS

Unit Syllabus: Importance of stability analysis in power system planning and operation - classification of power system stability - angle and voltage stability. – Single Machine Infinite Bus (SMIB) system: Development of swing equation - equal area criterion - determination of critical clearing angle and time– solution of swing equation by modified Euler method and Runge-Kutta fourth order method. Introduction to multi-machine stability analysis

Objective: To model and analyze the transient behavior of power system when subjected to a fault.

Session No *	Topics to be covered	Ref	Teaching Aids
1	Importance of stability analysis in power system planning and operation	1, 2, 5	PPT
2	Classification of power system stability - angle and voltage stability	1, 2, 5	PPT
3	Single Machine Infinite Bus (SMIB) system: Development of swing equation	1, 2, 5	PPT
4	Numerical examples; Improved Swing Equation and Its Properties in Synchronous Generators	1, 2, 5, IEEE paper	PPT
5	Equal area criterion - determination of critical clearing angle and time	1, 2, 5	PPT
6	Numerical examples	1, 2, 5	PPT
7	Solution of swing equation by modified Euler method	5	PPT
8	Solution of swing equation by Runge-Kutta fourth order method	5	PPT
9	Introduction to multi-machine stability analysis	2, 5	PPT
10	Tutorial	1, 2, 5	PPT

Content beyond syllabus covered (if any): Improved Swing Equation and Its Properties in Synchronous Generators

* Session duration: 50 mins

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REFERENCES:

1. Nagrath I.J. and Kothari D.P., 'Modern Power System Analysis', Tata McGraw-Hill, Fourth Edition, 2011.
2. John J. Grainger and W.D. Stevenson Jr., 'Power System Analysis', Tata McGraw-Hill, Sixth reprint, 2010.
3. P. Venkatesh, B.V. Manikandan, S. Charles Raja, A. Srinivasan, ' Electrical Power Systems-Analysis, Security and Deregulation', PHI Learning Private Limited, New Delhi, 2012.
4. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
5. Kundur P., 'Power System Stability and Control, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 10th reprint, 2010.
6. Pai M A, 'Computer Techniques in Power System Analysis', Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.
7. J. Duncan Glover, Mulukutla S. Sarma, Thomas J. Overbye, ' Power System Analysis & Design', Cengage Learning, Fifth Edition, 2012.
8. Olle. I. Elgerd, 'Electric Energy Systems Theory - An Introduction', Tata McGraw Hill Publishing Company Limited, New Delhi, Second Edition, 2012.
9. C.A.Gross, "Power System Analysis," Wiley India, 2011.

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Designation	ASP/EEE	AP/EEE	PROFESSOR & HEAD
Date	19.6.2020		19.06.2020

Remarks *:

As there is no change in previous semester (Aug 2020 - Dec 2020) lesson plan, same lesson plan is followed for this semester (Aug 2021 - Dec 2021)

Remarks *:

M. SANKAR 25/7/21 AP/EEE

DHEEBAN SS 25/7/21 AP/EEE

KR. Santha
Dr. KR. SANTHA
VP, Prof & HOD / EEE

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD

Same lesson plan has been followed for the academic year 2022-2023.

[signature] AP/EEE [signature] AP/EEE KR. Santha 8.8.22

The same lesson plan has been followed for academic year 2023 - 2024

Dr. R. Kannadasan (AP/EEE)	Mr. ARUN ABHISHEK I (AP/EEE)	24.7.23 Dr K R Santha HOD/EEE VP, Professor