Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Third Year Bachelor of Engineering (EE)

With effect from: Academic Year 2019-20

Subject Code: EE503-N	Subject Title: Power System - II
Pre-requisite	

Course Objective:

- To present a problem oriented introductory knowledge of Electrical power of engineering systems.
- To understand concepts and methodology of Electrical power system analysis.
- To focus on fault analysis for electrical power system.

Teaching scheme				Total Credit	Evaluation Scheme					Total Marks
L	T	P	Total		Theory		IE Marks	CIA Marks	Pract. Marks	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks				
04	00	02	06	05	03	70	30	20	30	150

Outline of the Course:

Sr. No	Title of the Unit	Minimum Hours
1	**Transmission line parameters**	**9**
2	**Current and Voltage Relations on a Transmission Line**	**7**
3	**System Modeling Transformers**	**9**
4	**Symmetrical Three-Phase Faults**	**7**
5	**Symmetrical Components**	**10**
6	**Unsymmetrical Faults**	**6**
7	**Transients in Power Systems**	**8**
8	**Corona**	**4**

Total Hours (Theory): 60
Total Hours (Lab): 30
Total Hours: 90

Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Third Year Bachelor of Engineering (EE)

With effect from: Academic Year 2019-20

Detailed Syllabus

Sr. N	Topic	Lecture Hours	Weightage(%)
1	**Transmission line parameters:** Inductance of 1-phase, two-wire line and composite conductor lines, inductance of 3-phase line with symmetrical and unsymmetrical spacing with and without transposition, double circuit line, bundled conductors, resistance and skin effect and proximity effect, capacitance of 1-phaseand 3-phase transmission line, effect of earth on transmission line capacitance performance, Ferranti effect	**9**	**13%**
2	**Current and Voltage Relations on a Transmission Line:** Representation of line, The short transmission line, The medium-length line, The long transmission line: Solution of the differential equations, The long transmission line: Interpretation of the equations, The long transmission line: Hyperbolic form of the differential equations, The equivalent circuit of a long line,Power flow through a transmission line,Reactive power compensation of transmission line.	**7**	**13%**
3	**System Modeling Transformers:** The ideal transformer, The Autotransformer, Per-Unit Impedances in single-phase Transformer circuits, Three-phase transformers, Per-Unit Impedances of Three-winding Transformers, The one-line diagram, Impedance and Reactance Diagrams, The advantages of Per-unit ComputationsTransformers: Three-phase connections and Phase-shifts. Three-winding transformers, autotransformers,Neutral Grounding transformers. Tap-Changing in transformers.	**9**	**15%**
4	**Symmetrical Three-Phase Faults** Transients in RL Series circuits, Short-Circuit currents and the reactances of Synchronous machines, Internal voltages of loaded machines under transient conditions, The bus impedance matrix in fault calculations, A bus impedance matrix equivalent network, The selection of circuit breakers.	**7**	**10%**
5	**Symmetrical Components** Synthesis of Unsymmetrical phasors from their symmetrical components, Operators, The symmetrical components of unsymmetrical phasors, Phase shift of symmetrical components in Star-Delta Transformer Banks, Power in terms of symmetrical components, Unsymmetrical Series impedances, Sequence Impedances and sequence networks, Sequence networks of Unloaded Generators, Sequence impedances of circuit elements, Positive and negative sequence networks. Zero-Sequence Network Representation of lines and transformers in sequence networks.	**10**	**15%**

6	**Unsymmetrical Faults** Single line to ground fault on an unloaded generator, Line to Line fault on an unloaded generator, Double Line to Ground fault on an unloaded generator, Unsymmetrical faults on power systems, Single line to Ground fault on a power system, Line to Line fault on a power system. Double Line to Ground fault on a power system, Interpretation of the interconnected sequence networks, Analysis of unsymmetrical faults using the bus impedance matrix, Faults through impedance, Computer calculations of fault currents.	**6**	**12%**
7	**Transients in Power Systems** Transients in Simple Circuits, 3-phase Sudden Short Circuit of an Alternator, The Restriking Voltage after Removal of Short Circuit, Travelling Waves on Transmission Lines, Attenuation of Travelling Waves, Capacitance Switching, Overvoltage due to Arcing Ground. Generation of Over-voltages: Lightning and Switching Surges. Protection against Over voltages. Insulation Coordination.	**8**	**15%**
8	**Corona** Critical Disruptive Voltage, Corona Loss, Line Design based on Corona, Disadvantages of Corona, Radio Interference, Inductive interference between Power and Communication lines	**4**	**7%**
	Total	**60**	**100**

Instructional Method and Pedagogy:

- At the start of course, the course delivery pattern , prerequisite of the subject will be discussed
- Lecture may be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lectures and laboratory, which may carries five marks in overall evaluation.
- One internal exam of 30 marks is conducted as a part of mid semester evaluation.
- Assignment based on course content will be given to the student for each unit/topic and will be evaluated at regular interval. It may carries a weight age of five marks in the overall internal evaluation.
- Surprise tests/Quizzes/Seminar /Tutorial may be conducted and having share of five marks in the overall internal evaluation.

Learning Outcome

On successful completion of the course

- The student can be acquired the basic knowledge of Electrical power system analysis Engineering.
- The students will be able to effectively employ electrical systems and lead the exploration of new applications and techniques for their use**.**

Text Book & Reference Books:

- Elements of Power Systems Analysis : W. D. Stevenson Jr., 4th Edition, McGraw Hill International.
- Power system engineering by D.P.Kothari and I.J.Nagrath, Mcgraw hill
- Principles of power system by V.K.Mehta, S.Chand
- Electrical Power system by C.L.Wadhwa, 5th Edition, New Age International Publishers.
- Power System Analysis by Hadi Saadat, Tata McGraw Hill.
- Power Systems Analysis by A R Bergen, Vijay Vittal, 2nd edition, Pearson Education

Kadi Sarva Vishwavidyalaya

Faculty of Engineering & Technology

Third Year Bachelor of Engineering (EE)

With effect from: Academic Year 2019-20

Suggested List of Experiments:

Sr. No.	Name of experiment
1.	Introduction to MATLAB Programming
2.	Matrix and array solution in MATLAB
3.	Solution set of linear equation using MATLAB
4.	Euler's method of ODE using MATLAB
5.	Solution of nonlinear equation using Gauss-Siedel iteration
6.	method in MATLAB
7.	MATLAB program to evaluate line performance parameters
8.	MATLAB program to find out the variation of voltage regulation with power factor for a short transmission line.
9.	MATLAB program for computing the ABCD parameters of short, medium and long transmission lines.
10	MATLAB program for conversion of AC Phasors to symmetrical components and vice versa.