Kadi Sarva Vishvavidyalaya, Gandhinagar
Bachelor of Engineering (Electrical Engineering Syllabus)

B.E Semester: Vth (EE)

Subject Name & Subject Code: Electrical Power-II (EE-501)

Course Objective:

- To present a problem oriented introductory knowledge of Electrical power of Engineering systems.
- To understand concepts of Electrical power Engineering.

A. **Teaching / Examination Scheme**

SUBJECT		Teaching Scheme				Total Credit	Examination Scheme					Total Marks
		L	T	P	Total		THEORY		IE	CIA	PR. / VIVO	
CODE	NAME	Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
EE-501	Electrical Power - II	4	0	0	4	4	3	70	30	20	00	120

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 compensation of transmission lines.

System Modeling:

Construction of the synchronous machine, Armature reaction in a synchronous machine, The circuit model of a synchronous machine, The effect of synchronous-machine excitation, The ideal transformer, The equivalent circuit of a practical 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 Computations.

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.

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 networks.

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.

Corona:

Critical Disruptive Voltage, Corona Loss, Line Design based on Corona, Disadvantages of Corona, Radio Interference, Inductive interference between Power and Communication lines.

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.

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- 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, practical's and Tutorial which carries 05 Marks.
- At regular intervals assignments is given. In all, a student should submit all assignments of 05 marks each.

B. **Lesson Planning**

SR No.	Lectures (Hours)	Weightage in % in Exam	Topic
1	06	30	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

2	08		The long transmission line: Hyperbolic form of the differential equations, The equivalent circuit of a long line, Power flow through a transmission line, Reactive compensation of transmission lines. Construction of the synchronous machine, Armature reaction in a synchronous machine, The circuit model of a synchronous machine, The effect of synchronous-machine excitation, The ideal transformer
3	06		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 Computations.
4	06	25	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.
5	08		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
6	06	20	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.
7	06		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.
8	06	25	Critical Disruptive Voltage, Corona Loss, Line Design based on Corona, Disadvantages of Corona, Radio Interference, Inductive interference between Power and Communication lines.
9	04		Transients in Simple Circuits, 3-phase Sudden Short Circuit of an Alternator, The Restriking Voltage after Removal of Short Circuit,
10	04		Travelling Waves on Transmission Lines, Attenuation of Travelling Waves, Capacitance Switching, Overvoltage due to Arcing Ground.
	60	100	

C. **Instructional Method & 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. & equal weightage should be given to all topics while teaching and conduction of all examinations.
- Attendance is compulsory in lectures, which may carries five marks in overall evaluation.
- One/Two internal exams may be conducted and total/average/best of the same may be converted to equivalent of 30 marks as a part of internal theory 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 carry an importance of ten 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.

Students Learning Outcomes

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**.**

Suggested Books:

1. Elements of Power Systems Analysis : W. D. Stevenson Jr., 4th Edition, McGraw Hill International.

2. Electrical Power systems: C. L . Wadhwa, 5th Edition, New Age International

Publishers.

3. Power Systems Analysis by A R Bergen, Vijay Vittal, 2nd edition, Pearson Education.

4. Electric Energy Systems Theory An Introduction by Olle I Elgerd, Tata McGraw Hill.

5. Modern Power system Analysis by I J Nagrath, D P Kothari, Tata McGraw Hill.

6. Power System Analysis by Hadi Saadat, Tata McGraw Hill.