

Branch Name:	Electrical Engineering
Program Code:	ET109
Course Name:	Electrical Power-II
Course Code:	1ET1090502
Pre-requisite Course:	Elements of Electrical Engineering, Electrical Machine I & II, Electrical Power-I

Course Objectives:

1. Electrical Power is a subject where a student will learn the generalized theory of Electrical and Mechanical design of Transmission line.
2. To make the students aware of the basic parameters of transmission line like resistance, inductance and capacitance and the impact of length of transmission line upon the parameter calculation.
3. To learn about corona effect and its advantages and disadvantages on performance of power system.

Teaching and Examination Scheme:

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)								
Lecture	Tutorial	Practical	Credit	Theory				Practical				Total
				University Assessment		Continuous Assessment		University Assessment		Continuous Assessment		
				Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
4	-	2	5	28	70	12	30	12	30	08	20	150

Course Contents:

Sr. No.	Topic	Total Hours	Weightage (%)
1	Supply Systems: Electric supply system, Typical AC power supply Scheme, Comparison of DC and AC transmission, Advantages of high transmission voltage, Various system of power transmission, Comparison of conductor material in overhead system, Comparison of conductor material in underground system, Comparison of various systems of transmission, Elements of a transmission line, Economics of power transmission, Economical choice of conductor size, Economic choice of transmission voltage, Requirement of satisfactory electric supply.	09	16
2	Mechanical Design of Transmission Lines: Main components of over head lines, Conductor materials, Line supports, insulators, Types of insulators, Potential distribution over suspension insulators, String efficiency, Methods of improving string efficiency, Sag in over head lines and sag calculations.	07	13
3	Inductance and Resistance of Transmission Line: Introduction, Definition of Inductance, Flux Linkages of an isolated current carrying conductor, Inductance of a single phase two wire line, Conductor types, Flux Linkages of one conductor in group, Inductance of composite conductor lines, Inductance of three phase lines, Double circuit three	09	16

	phase lines, Bundled conductors, Resistance, Skin effect and Proximity effect, Magnetic field induction.		
4	Capacitance of Transmission Lines: Introduction, Electric field of a long straight conductor, Potential difference between two conductors of a group of parallel conductors, Capacitance of a two wire line, Capacitance of a three phase line with equilateral spacing, Capacitance of a three phase line with unsymmetrical spacing, Effect of earth on transmission line capacitance, Method of GMD, Bundled conductors.	07	13
5	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 (circle diagrams), and Reactive compensation of transmission lines.	09	16
6	Corona: Critical Disruptive Voltage, Corona Loss, Line Design based on Corona, Disadvantages of Corona, Radio Interference, Inductive interference between Power and Communication lines.	07	13
7	Underground cables: Underground cables, Construction of cables, Classification of cables, Cables for three phase services, Insulation resistance of a single core cable, Capacitance of a single core cable, Dielectric stresses in a single core cable, most economical conductor size in a cable, grading of cables, Capacitance grading and inter sheath grading, Capacitance of three core cable and measurement of capacitance.	08	13

Reference Books:

1. Power System Analysis: John J. Grainger, William D. Stevenson Jr., Tata McGraw Hill, 2005.
2. Elements of Power Systems Analysis: W. D. Stevenson Jr., 4th Edition, McGraw Hill International, 2013.
3. Electrical Power systems: C. L. Wadhwa, 5th Edition, New Age International Publishers, 2017.
4. Principles of Power System: V.K. Mehata, S. Chand publications, 1999.
5. Modern Power System Analysis by I J Nagrath, D P Kothari, 4th Edition Tata McGraw Hill, 2006.
6. Power System Analysis by Hadi Saadat, Tata McGraw Hill, 2008.

List of Experiments:

1. To write a computer program for sag calculation of transmission line for equal and unequal level of supporting towers.
2. To write a computer program for calculation of inductance of single phase and three phase transmission line.
3. To write a computer program for calculation of capacitance of single phase and three phase transmission line.
4. To find out the efficiency, regulation and generalized constants of a short transmission line.

5. To write computer program for voltage regulation and efficiency of short transmission line for different specified set of receiving end quantities.
6. To write computer program for voltage regulation and efficiency of medium transmission line for different specified set of receiving end quantities.
7. To write computer program for voltage regulation and efficiency of long transmission line for different specified set of receiving end quantities.
8. Generation and visualization of Corona in corona cage.

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Understand about the supply system of transmission line.	2 Understanding
CLO2	Analyze the basic parameters of transmission line as well as underground cable.	4 Analyze
CLO3	Analyze the performance of Short and Medium transmission line.	4 Analyze
CLO4	Describe corona effect.	1 Remembering
CLO5	Analyze Current and Voltage Relations on a Transmission Line.	4 Analyze
CLO6	Identify problems related to transmission line.	5 Evaluate

Mapping of CLOs with POs & PSOs:

Course Learning Outcomes	Program Outcomes (POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	M		L			M					M			L	M	
CLO2				L	L		M		M	L			L			M
CLO3		L		M			L	L			L					L
CLO4	L		M		H							M			L	
CLO5		L		M		L	L		L		M		M	H		
CLO6			L		L			L		M		M	L			L

H: High, M: Medium, L: Low