19EE213 POWER TRANSMISSION AND DISTRIBUTION

Hours Per Week :

L	T	P	C
3	1	-	4

Source: https://www.dreamstime.com/ renewable

PREREQUISITE COURSE: Basic Engineering Products.

COURSE DESCRIPTION AND OBJECTIVES:

This course provides an overview of various types of electric substations and the methods for improvement of power factor. It also provides the knowledge of transmission line parameters, cables and insulators. The objective of this course is to enable the students to understand the economic aspects of power generation, analyse the performance of transmission lines, distribution systems, insulators and cables.

COURSE OUTCOMES:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes
1	Analyse the significance for economic analysis of power generation and power factor.
2	Determine the parameters of transmission line.
3	Evaluate the performance of short, medium and long transmission lines.
4	Understand the role of insulators and able to calculate the string efficiency.
5	Analyse the selection of underground cables, different distribution system topologies.

SKILLS:

- ***ü*** *Design overhead transmission lines by considering different parameters.*
- ***ü*** *Design and suggest insulators for specific voltage level.*
- ***ü*** *Design underground cables by considering different parameters.*
- ***ü*** *Identify reasons for voltage fluctuations at the consumer end.*

UNIT - I **L - 9, T - 3**

ECONOMICS OF POWER GENERATION: Load curve, load duration and integrated load duration curves, load, demand, diversity, capacity, utilization and plant use factors, numerical problems.

POWER FACTOR CORRECTION: Causes of low power factor, methods of improving power factor-static capacitors, synchronous condenser, phase advancers. Most economical power factor for constant KW load and constant KVA type loads.

SUBSTATIONS: Classification of substations, selection of site and layout of substation, bus bar arrangements.

UNIT - II **L - 9, T - 3**

TRANSMISSION LINE PARAMETERS: Classification of line conductors- solid, stranded, composite, bundled and ACSR conductor, calculation of resistance, skin effect, inductance and capacitance of single phase and three phase lines with symmetrical and unsymmetrical spacing, proximity effect, significance of transposition.

UNIT - III **L - 9, T - 3**

PERFORMANCE OF TRANSMISSION LINES: Classification of lines - short, medium (nominal T and p) and long (equivalent T and p), calculation of A, B, C, D constants, ferranti effect, power flow through a transmission line.

CORONA: Introduction, critical disruptive voltage, corona loss, factors affecting corona loss and methods of reducing corona loss, disadvantages of corona, interference between power and Communication lines. Numerical problems.

UNIT - IV **L - 9, T - 3**

SAG AND TENSION CALCULATIONS: Sag and tension calculations with equal and unequal heights of towers, effect of wind and ice on weight of conductors, stringing chart, sag template.

OVERHEAD LINE INSULATORS: Types of insulators, string efficiency and methods for improvement, voltage distribution, calculation of string efficiency, capacitance grading and static shielding.

UNIT - V **L - 9, T - 3**

UNDERGROUND CABLES: Types of cables, construction, calculation of insulation resistance and stress in insulation, capacitance of single core belted cables, numerical problems, grading of cables, proximity effect

AC DISTRIBUTION: Introduction, AC distribution, single phase, 3-phase 3 wire, 3 phase 4 wire system.

TEXT BOOKS:

1. C.L. Wadhwa, “Generation, Distribution and Utilization of Electrical Energy”, 7th edition, New Age International, 2016.
2. W.D. Stevenson, “Elements of Power System Analysis,” 4th edition, Mc Graw Hill, 2000.

REFERENCE BOOKS:

1. C.L. Wadhwa, “Electrical Power Systems”, 5th edition, New Age International, 2009.
2. M.V. Deshpande, “Elements of Electrical Power Station Design”, 3rd edition, Wheeler Pub. 1998.