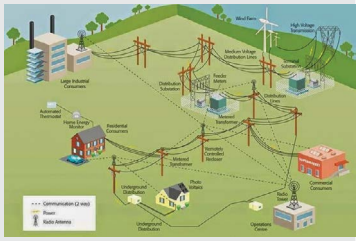

Source: https://www.pinterest.com/pin/power-generationtransmissionand-distribution-by-smart-grids-electrical-eng--104075441365330046/

22EE202 POWER TRANSMISSION AND DISTRIBUTION

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basic Engineering Products, Electrical Circuit Analysis.

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.

MODULE-1

UNIT-1 **10L+0T+0P=10 Hours**

ECONOMICS OF POWER GENERATION, POWER FACTOR CORRECTION AND TRANSMISSION LINE PARAMETERS:

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.

Transmission Line Parameters: Classification of line conductors, 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-2 **6L+0T+16P=22 Hours**

SUBSTATIONS AND PERFORMANCE OF TRANSMISSION LINES:

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

- **Performance of Transmission Lines:** Classification of lines - short, medium (nominal T and) and long (equivalent T and), calculation of A, B, C, D constants, ferranti effect, power flow through a transmission line.

PRACTICES:

- Familiarization of the transmission line.
- Verification of Ferranti Effect of the transmission line.
- ABCD parameters of transmission line.
- Finding the efficiency of the transmission lines at different loads.

MODULE-2

UNIT-1 **8L+0T+0P=8 Hours**

SAG AND TENSION CALCULATIONS, OVERHEAD LINE INSULATORS AND CORONA:

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.

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-2 **8L+0T+16P=24 Hours**

UNDERGROUND CABLES AND AC DISTRIBUTION:

Underground Cables: Types of cables, construction, calculation of insulation resistance, stress and capacitance, grading of cables, proximity effect.

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

PRACTICES

- Determination of the SIL of the transmission line.
- Determination of regulation of the given transmission line.
- To find out the string efficiency across the string of insulators.
- Formation for symmetric π configuration for Verification of AD-BC=1.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Determine the parameters of transmission line.	Apply	1	1, 2, 3, 9, 11
2	Illustrate the role of insulators and calculation of string efficiency.	Apply	2	1, 2, 4, 6, 9, 11
3	Analyse the significance for economic analysis of power generation and power factor.	Analyze	1	1, 2, 9, 11
4	Analyse the selection of underground cables, different distribution system topologies.	Analyze	2	1, 2, 6, 7, 9, 11
5	Evaluate the performance of short, medium and long transmission lines.	Evaluate	1	1, 2, 5, 9, 11

TEXT BOOKS:

1. C.L. Wadhwa, “Generation, Distribution and Utilization of Electrical Energy”, 8th edition, New Age International, 2022.
2. W.D. Stevenson, “Elements of Power System Analysis,” 4th edition, Mc Graw Hill, 2000.

REFERENCE BOOKS:

1. C.L. Wadhwa, “Electrical Power Systems”, 6th edition, New Age International, 2018.
2. M.V. Deshpande, “Elements of Electrical Power Station Design”, 3rd edition, Wheeler Pub. 2018.

SKILLS:

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