16EE303 ELECTRICAL POWER TRANSMISSION AND DISTRIBUTION

Hours Per Week :

L	T	P	C
3	1	-	4

Total Hours :

L	T	P
45	15	-

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	-	8	5	-

Course Description and Objectives:

This course provides knowledge of transmission line parameters, models, distribution systems, cables and insulators. The objective of this course is to make the students to analyze the performance of transmission lines, distribution systems, insulation and cables.

Course Outcomes:

The student will be able to:

- compute the transmission line parameters.
- determine regulation and efficiency of transmission lines.
- perform mechanical design of transmission lines.
- classify and choose suitable insulators.
- analyse voltage distribution in a string of insulators and test the given insulators.

SKILLS:

- ***ü*** *Design overhead transmission lines by considering different parameters.*
- ***ü*** *Simulate transmission lines using MATLAB.*
- ***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 – 1 **L-10, T-3**

TRANSMISSION LINE PARAMETERS : Types of conductors - Calculation of resistance for solid conductors - Calculation of inductance for single phase, Three phase, Single and double circuit lines; Concept of GMR and GMD, Symmetrical and asymmetrical conductor configuration with and without transposition, Numerical Problems, Calculation of capacitance for 2 wire and 3 wire systems, Effect of ground on capacitance, Capacitance calculations for symmetrical and asymmetrical single phase, Three phase, Single and double circuit lines, Numerical problems.

UNIT – 2 **L-10, T-3**

PERFORMANCE OF SHORT AND MEDIUM LENGTH TRANSMISSION LINES: Classification of transmission lines - Short, Medium, Long line; Model representation of transmission lines - Short line, Nominal-T, Nominal-Pie and Numerical Problems; Performance of long transmission lines - Rigorous solutions, Evaluation of A,B,C,D constants, SIL of long lines, Wave length and velocity of propagation of waves, Numerical problems.

POWER SYSTEM TRANSIENTS: Types of system transients, Traveling or propagation of surges, Reflection and refraction coefficients, Termination of lines under different conditions.

UNIT – 3 **L-8, T-3**

OVERHEAD LINE INSULATORS: Types of insulators, String efficiency and methods for improvement, Numerical problems, Voltage distribution, Calculation of string efficiency, Capacitance grading and static shielding.

VARIOUS FACTORS GOVERNING THE PERFORMANCE OF TRANSMISSION LINES: Skin, Proximity and Ferranti effects, Corona - Description of the phenomenon, Factors affecting corona, Critical voltages and power loss.

UNIT - 4 **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, Numerical problems, String chart, Sag template and its applications.

UNDERGROUND CABLES: Types of cables, Construction, Calculations of insulation resistance and stress in insulation, Numerical problems, Capacitance of single and 3-core belted cables, Numerical problems, Grading of cables.

UNIT – 5 **L-8, T-3**

D.C. DISTRIBUTION SYSTEMS : Classification of distribution systems - Comparison of AC and DC distribution systems; Requirements of distribution systems, Voltage drop calculations (Numerical problems) in D.C distributors for the following cases - Radial D.C distributor fed one end, Both the ends (equal/unequal voltages) and ring main distributor.

A.C. DISTRIBUTION SYSTEMS : Voltage drop calculations (Numerical problems) in A.C. distributors for the following cases - Power factors referred to receiving end voltage and with respect to load voltages.

TEXT BOOKS:

1. I.J.Nagarath and D.P Kothari, “Modern Power System Analysis” 3rd edition, Tata Mc-Graw Hill, 2008.
2. C.L.Wadhwa, “Electrical power systems”, 4th edition, New Age International (P) Limited Publishers, 2008.

REFERENCE BOOKS:

1. John J.Grainger and William D Stevenson, “Power system Analysis”, 1st edition, Tata Mc-Graw Hill, 2005.
2. B.R.Gupta, “Power System Analysis and Design” 3rd edition, Wheeler Publishing, 1999.
3. Hadi Saadat, “Power System Analysis”, 1st edition, Tata Mc-Graw Hill, 1999.

ACTIVITIES:

- *Make a prototype of single line diagram of substation (any one of 220/132/ 66 KV).*
- *Determine the ABCD parameters of a transmission line.*
- *Study characteristics of different types of insulators.*
- *Find the capacitance and voltage rating of an over-head insulator.*
- *Identify the different parts of a cable by observing the inner layers.*