III B.Tech – I Semester
(20EE5010) POWER SYSTEMS-II

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre-Requisites: Power Systems – I

Course Objectives:

- To compute inductance/capacitance of network lines and to understand the concept of GMD/GMR.
- To study the length of transmission lines, their models and performance.
- To study the different types of cables and their performance.
- To study the effect of travelling waves on transmission lines and factors affecting the performance of transmission lines
- To discuss sag and tension computation of transmission lines as well as to study the performance of overhead insulators.

UNIT-I: Transmission Line Parameters

Conductor materials - Types of conductors –Calculation of resistance for solid conductors – Calculation of inductance for single phase and three phase– Single and double circuit lines– Concept of GMR and GMD– Symmetrical and asymmetrical conductor configuration with and without transposition–Bundled conductors-Numerical Problems–Calculation of capacitance for 2 wire and 3 wire systems – Effect of ground on capacitance – Capacitance calculations for symmetrical and asymmetrical single and three phase–Single and double circuit lines- Bundled conductors.

UNIT-II: Performance of Transmission Lines

Classification of Transmission Lines – Short, medium, long line and their model representations –Nominal-T–Nominal-Pie and A, B, C, D Constants, Voltage Regulation and Efficiency-Rigorous Solution for long line equations – Surge Impedance and SIL of Long Lines – Representation of Long lines – Equivalent T and Equivalent Pie network models.

UNIT-III: Underground Cables

Types of Cables, Construction, Types of insulating materials, Calculation of insulation resistance, stress in insulation and power factor of cable. Capacitance of single and 3-Core belted Cables: Grading of Cables-Capacitance grading and Inter sheath grading.

UNIT-IV: Power System Transients and Factors Governing Performance of Lines

Types of System Transients – Travelling or Propagation of Surges – Attenuation–Distortion–Reflection and Refraction Coefficients – Termination of lines with different types of conditions – Open Circuited Line– Short Circuited Line – T-Junction– Lumped Reactive Junctions.

Skin and Proximity effects –Ferranti effect – Charging Current–Corona – Description of the phenomenon– Factors affecting corona–Critical voltages and power loss – Radio Interference.

UNIT-V: Sag and Tension Calculations and Overhead Line Insulators

Sag and Tension calculations with equal and unequal heights of towers–Effect of Wind and Ice on weight of Conductor–Numerical Problems – Stringing chart and sag template and its applications–Types of Insulators – String efficiency and Methods for improvement– Numerical Problems – Voltage distribution–Calculation of string efficiency–Capacitance grading and Static Shielding.

Course Outcomes:

After successful completion of the course, the students will be able to:

S.No	Course Outcome	BTL
1.	Able to evaluate the different parameters of several transmission lines under various scenarios.	L6
2.	Able to determine the efficiency, regulation and other performance parameters of the network lines.	L5
3.	Able to evaluate the complete performance of the underground high and low power cables.	L5
4.	Able to analyze transients and the concepts related to travelling waves on and various factors governing the performance of transmission lines.	L4
5.	Able to calculate sag/tension of transmission lines and performance of line insulators.	L3

Correlation of COs with POs& PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2		1								3	2
CO2	3	3	2		1								3	2
CO3	3	3	1										3	2
CO4	3	3	2		1								3	2
CO5	3	3	2		2								3	2

Text Books:

1. Electrical power systems – by C. L. Wadhwa, New Age International (P) Limited, Publishers, 1998.
2. Modern Power System Analysis by I. J. Nagarath and D. P. Kothari, Tata McGraw Hill, 2nd Edition.

Reference Books:

1. Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4thedition
2. Power System Analysis and Design by B. R. Gupta, Wheeler Publishing.
3. A Text Book on Power System Engineering by M. L. Soni, P. V. Gupta, U.S. Bhatnagar, A. Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.