



JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA
KAKINADA-533003, Andhra Pradesh, India
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

III Year –I SEMESTER		L	T	P	C
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POWER SYSTEMS–II					

Preamble:

This course is an extension of power systems-I course. It deals with basic theory of transmission lines modeling and their performance analysis. Transients in power system and effects of corona are discussed in detail. It is important for the student to understand the mechanical design aspects of transmission lines, insulators. These aspects are also covered in detail in this course.

Course Objectives:

- To understand the concepts of GMD/GMR and to compute inductance/capacitance of transmission lines.
- To distinguish the short and medium length transmission lines, their models and performance.
- To understand the performance and modeling of long transmission lines.
- To learn the effect of travelling waves on transmission lines.
- To learn the concepts of corona and the factors effecting corona..
- To understand sag and tension computation of transmission lines as well as to learn the performance of overhead insulators.

UNIT-I

Transmission Line Parameters

Conductor materials – Types of conductors – Calculation of resistance for solid conductors – Skin and Proximity effects – 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 – 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 without and with Bundled conductors.

UNIT-II

Performance Analysis of Transmission Lines

Classification of Transmission Lines – Short, medium, long lines and their model representation – Nominal-T, Nominal-Pie and A, B, C, D Constants for symmetrical and Asymmetrical Networks. Rigorous Solution for long line equations –Representation of Long lines – Equivalent T and Equivalent Pie network models - Surge Impedance and Surge Impedance Loading (SIL) of Long Lines - Regulation and efficiency for all types of lines – Ferranti effect.

UNIT – III

Power System Transients

Types of System Transients – 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.

UNIT-IV

Corona

Description of the phenomenon – Types of Corona - critical voltages and power loss – Advantages and Disadvantages of Corona - Factors affecting corona - Radio Interference.



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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 – Stringing chart and sag template and its applications

Types of Insulators – String efficiency and Methods for improvement - Voltage distribution–Calculation of string efficiency – Capacitance grading and Static Shielding.

Course Outcomes:

After the completion of the course the student should be able to:

- Calculate parameters of transmission lines for different circuit configurations.
- Determine the performance of short, medium and long transmission lines.
- Analyse the effect of travelling waves on transmission lines.
- Analyse the various voltage control methods and effect of corona.
- Calculate sag/tension of transmission lines and performance of line insulators.

Text Books:

1. Electrical Power Systems – by C.L.Wadhwa, New Age International (P) Limited, 1998.
2. Power System Engineering by I.J.Nagarath and D.P.Kothari, Tata McGraw Hill, 3rd Edition.

Reference Books:

1. Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4th edition
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, DhanpatRai Co Pvt. Ltd.2016
4. Electrical Power Systems by P.S.R. Murthy, B.S. Publications, 2017.