

PS5004 PRINCIPLES OF ELECTRIC POWER TRANSMISSION

DETAILED SYLLABUS

OBJECTIVES

To impart knowledge on,

- Types of power transmission and configurations.
- Various parameters and voltage gradients of transmission line conductors.
- The design requirements of EHV AC and DC lines.

UNIT I INTRODUCTION

Standard transmission voltages-AC and DC – different line configurations– average values of line parameters – power handling capacity and line loss – costs of transmission lines and equipment – mechanical considerations in line performance.

UNIT II CALCULATION OF LINE PARAMETERS

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – effect of ground return.

UNIT III VOLTAGE GRADIENTS OF CONDUCTORS

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors– gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers-I²R loss and corona loss-RIV.

UNIT IV ELECTROSTATIC FIELD AND DESIGN OF EHV LINES

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines- effect of high field on humans, animals, and plants - measurement of electrostatic fields – electrostatic Induction in unenergized circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference, Design of EHV lines.

UNIT V HVDC LINES

Introduction- Reliability and failure issues-Design-tower, ROW, clearances, insulators, electrical and mechanical protection-Maintenance-Control and protection-D.C Electric field and Magnetic field -Regulations and guide lines-underground line design.

REFERENCES

1. Rakosh Das Begamudre, "Extra High Voltage AC Transmission Engineering", Second Edition, New Age International Pvt. Ltd., 2006.
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3. Sunil S.Rao, "EHV-AC, HVDC Transmission & Distribution Engineering", Third Edition, Khanna Publishers, 2008.
4. William H. Bailey, Deborah E. Weil and James R. Stewart, "A Review on HVDC Power Transmission Environmental Issues", Oak Ridge National Laboratory.
5. J.C Molburg, J.A. Kavicky, and K.C. Picel, "A report on The design, Construction and operation of Long-distance High-Voltage Electricity Transmission Technologies" Argonne (National Laboratory) 2007.
6. "Power Engineer's Handbook", Revised and Enlarged 6th Edition, TNEB Engineers' Association, October 2002