EE 205: TRANSMISSION & DISTRIBUTION (3-1-2 : 5)

Supply Systems:
Basic structure of an A.C power system, different kinds of supply system and their comparison, advantages of high transmission voltage, various systems of power supply, comparison of conductor materials in overhead system and underground cable system, economic choice of conductor size and economic choice of transmission voltage.

Distribution of Electrical Power:
Types of D.C distributors, D.C distribution calculations, A.C distributor, fed at one and fed at both the ends with concentrated loads and uniformly distributed loads, ring distributors with interconnector, current distribution in three wire and four wire ac systems, overview of distribution automation.

Mechanical Aspects of Overhead Lines:
Main components of over head lines, conductor materials, line supports, insulators, types of insulators, potential distribution over suspension insulators, string efficiency, methods of improving string efficiency, Corona, factors affecting corona, advantages and disadvantages of corona, sag in over head lines, calculation of sag and tension.

Underground Cables:
Introduction, cable construction, classification of cables, cables for three phase services, insulation resistance of a single core cable, capacitance of a single core cable, dielectric stresses in a single core cable, most economical conductor size in a cable, grading of cables, capacitance grading/Dielectric grading, inter-sheath grading, limitations of grading, Cable capacitance, charging or capacitive current, capacitance of three core cable and measurements of capacitances.

Electrical Design of Overhead Lines:
Conductors, types of conductors, bundled conductor, spacing of conductors, symmetrical and asymmetric spacing, equivalent spacing, transposition, transmission line constants, calculation of resistance, inductance and capacitance for simple arrangements and multi-circuit lines, symmetrical and unsymmetrical spacing, concept of self GMD, mutual GMD and their uses in calculations of parameters of overhead lines, skin and proximity effects.

Characteristics and Performance of Power Transmission Lines:
Short and medium transmission lines, Line performance, effect of capacitance, charging currents, short and medium lines, calculation by nominal-T, nominal-π and end-condenser method, regulation and efficiency, Concept of ABCD constants, the long transmission line- rigorous solution, evaluation of ABCD constants, interpretation of long line equation, surge impedance and surge impedance loading, the equivalent circuit of a long transmission line, power flow through a transmission line, circle diagrams, Ferranti effect.

Economic Aspects of Power System:
Cost of Generation and Tariff, Power factor and its effect on system economy, Power factor improvement.

Suggested list of Laboratory Experiments:

1. To find out A, B, C, D parameter, hybrid parameter and image parameter of a given transmission model.
2. To Study the Performance of a Long Transmission Line Under No Load Condition.
3. To Study the Performance of a Long Transmission Line Under Lightly Load Condition.
4. To Study the Performance of a Long Transmission Line Under Load At Different Power Factors.
5. To Study the Performance Characteristics Of A Typical Dc Distribution System (Radial Configuration).
6. To design and study the dynamic performance of an isolated hydro system using simulation.

7. To use Static compensator in a Transmission line and verify its output voltage and current.
8. To study the Ferranti Effect of long transmission line.
9. To find the string efficiency of a string insulator with/without guard rings
10. To plot the power angle characteristics of given transmission lines.
11. Develop a generalized program for calculation of corona loss
12. To Study the dynamic interaction between two control areas using simulink and modeling and economic dispatch.

Text Books:

1) W. D. Stevenson, "Element of Power System Analysis", Mc Graw Hill.
2) C.L.Wadhwa, "Electric Power System", New Age International Ltd.
3) Ashfaq Hussain, "Electric Power Systems", CBS Publisher & Distributors.

Reference Books

1) Nagrath & kothari, "Power System Engineering", TMH publishing Company Ltd.
2) Luces m. Faulkenberry & Walter Coffer, "Electric Power Distribution and Transmission", Pearson.
3) A.Chakrabarti, M.L.Soni, P.V.Gupta, & U.S.Bhatnagar, "A Text Book on Power System Engineering", Dhanpat Rai & Co.