ELECTRICAL POWER TRANSMISSION & DISTRIBUTION

Module – I **(13 Hours)**

Transmission Line Parameters: (Book – 1, Ch.4)

Types of Conductors, Resistance, Tabulated Resistance Values, Inductance of a Conductor due to Internal Flux, Flux Linkages between Two Points External to an Isolated Conductor, Inductance of a Single Phase Two Wire Line, Flux Linkages of One Conductor in a Group, Inductance of Composite-Conductor Lines, The Use of Tables, Inductance of a Three Phase Line with Equilateral Spacing, Inductance of a Three Phase Line with Unsymmetrical Spacing, Inductance Calculations for Bundled Conductors. **Book-1:Ch. 4.1, Ch. 4.2, Ch. 4.3, Ch. 4.4, Ch. 4.5, Ch. 4.6, Ch. 4.7, Ch. 4.8, Ch. 4.9, Ch. 4.10, Ch. 4.11, Ch. 4.12.**

Resistance, Inductance, Capacitance (Book – 1, Ch.5)

Electric Field of a Long, Straight Conductor, The Potential Difference between Two Points due to a Charge, Capacitance of a Two Wire Line, Capacitance of a Three Phase Line with Equilateral Spacing, Capacitance of a Three Phase Line with Unsymmetrical Spacing, Effect of Earth on the Capacitance of a Three Phase Line, Capacitance Calculations for Bundled Conductors, Parallel-Circuit Three Phase Lines. **Book-1:Ch. 5.1, Ch. 5.2, Ch. 5.3, Ch. 5.4, Ch. 5.5, Ch. 5.6, Ch. 5.7, Ch. 5.8.**

Module – II **(12 Hours)**

Transmission Line Performances (Book – 1, Ch.6)

Short, Medium & Long Transmission Lines

Representation of Lines, Short Transmission Lines, The Medium Transmission Lines, The Long Transmission Line: Interpretation of Equations, The Long Transmission Line: Interpretation of Equations, The Long Transmission Line: Hyperbolic Form of The Equations, The Equivalent Circuit of a Long Line, Power Flow Through Transmission Line, Reactive Compensation of Transmission Line. **Book-1:Ch. 6.1, Ch. 6.2, Ch. 6.3, Ch. 6.4, Ch. 6.5, Ch. 6.6, Ch. 6.7, Ch. 6.8, Ch. 6.9.**

HVDC Transmission (Book – 2, Ch.15)

Introduction, Types of DC Links, Advantages of DC Transmission, Incorporating HVDC into AC system, Converter station Equipment, Ground Return, Earth Electrode, Station Earth, Reliability of HVDC Systems, Recent Advances, HVDC Systems in India. **Book-2:Ch. 15.1, Ch. 15.2, Ch.15.3, Ch. 15.4, Ch. 15.5, Ch. 15.6, Ch. 15.7, Ch. 15.8, Ch. 15.9, Ch.15.10.**

Overhead Line Insulators (Book – 2, Ch.4)

Insulator Materials, Types of Insulators, Voltage Distribution over Insulator String, Improvement of String Efficiency, Insulator Failure, Testing of Insulators. **Book-2:Ch. 4.1, Ch. 4.2, Ch.4.3, Ch. 4.4, Ch. 4.5, Ch. 4.6.**

Module – III **(15 Hours)**

Mechanical Design of Overhead Transmission Lines (Book – 2, Ch.5)

General Considerations, Line Supports, Types of Steel Towers, Cross Arms, Span, Conductor Configuration, Spacings and Clearances, Sag and Tension Calculations, Erection Conditions, Factors affecting Sag, Sag Template, Catenary, Conductor Vibration. **Book-2:Ch. 5.1, Ch. 5.2, Ch. 5.3, Ch. 5.4, Ch. 5.5, Ch. 5.6, Ch. 5.7, Ch. 5.8, Ch. 5.9, Ch.5.10, Ch.5.11.**

Distribution (Book – 2, Ch.16)

Comparison of various Distribution Systems, AC three-phase four-wire Distribution System, Types of Primary Distribution Systems, Types of Secondary Distribution Systems,

Voltage Drop in DC Distributors, Voltage Drop in AC Distributors, Kelvin's Law, Limitations of Kelvin's Law, General Design Considerations, Load Estimation, Design of Primary Distribution, Sub-Stations, Secondary Distribution Design, Economical Design of Distributors, Design of Secondary Network, Lamp Flicker, Application of Capacitors to Distribution Systems.

Book-2:Ch. 16.1, Ch. 16.2, Ch.16.3, Ch. 16.4, Ch. 16.5, Ch. 16.6, Ch. 16.7, Ch. 16.8, Ch. 16.9, Ch.16.10, Ch. 16.11, Ch. 16.12, Ch.16.13, Ch. 16.14, Ch. 16.15, Ch. 16.16, Ch. 16.17.

Underground Cables (Book – 2, Ch. 8)

Introduction, Insulation, Sheath, Armour and Covering, Classification of Cables, Pressurized Cables, Effective Conductor Resistance, Conductor Inductive Reactance, Parameters of Single Core Cables, Grading of Cables, Capacitance of Three Core Belted Cable, Breakdown of Cables, Cable Installation, Current Rating of Cables, System Operating Problems with Underground Cables, HVDC Cables.

Book-2:Ch. 8.1, Ch. 8.2, Ch.8.3, Ch. 8.4, Ch. 8.5, Ch. 8.6, Ch. 8.7, Ch. 8.8, Ch. 8.9, Ch.8.10, Ch. 8.11, Ch. 8.12, Ch.8.13, Ch. 8.14, Ch. 8.15.

Power System Earthing: (Book – 2, Ch.18)

Soil Resistivity, Earth Resistance, Tolerable Step and Touch Voltage, Actual Touch and Step Voltages, Design of Earthing Grid.

Book-2: Ch. 18.4, Ch. 18.5, Ch. 18.6, Ch. 18.7, Ch. 18.8.

Text Books:

1. **Power System Analysis- By John J. Grainger & W. D. Stevenson, Jr, Tata Mcgraw-Hill, 2003 Edition, 15th Reprint, 2010.**
2. **Power System Analysis & Design- By B. R. Gupta, S. Chand Publications, 3rd Edition, Reprint, 2003.**