5th Semester	REL5C001	Electric Power Transmission and Distribution	L-T-P 3-0-0	3 Credits

Electric Power Transmission and Distribution

Module I: **(4 hours)**

Evolution of Power Systems and Present-Day Scenario. Structure of power system. Conventional sources of Electrical Energy, Hydroelectric Power Generation, Thermal Power Generation and Nuclear Power Generation.

Module II: **(10 hours)**

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-Conductors, Concept of GMD, Transposition of lines, Inductance of a Three Phase Line with symmetrical and Unsymmetrical Spacing, Inductance Calculations for Bundled Conductors, Skin effect and Proximity effect. Capacitance of a Two Wire Line, Capacitance of a Three Phase Line with symmetrical and Unsymmetrical Spacing, Effect of Earth on the Capacitance of a Three Phase Line, Capacitance Calculations for Bundled Conductors, Parallel- Circuit Three Phase Lines. Corona.

Module III: **(12 hours)**

Representation of Short, medium and long Transmission Line, Equivalent Circuit, Calculation and analysis of performance of transmission lines, Voltage Profile of transmission lines, Ferranti Effect, Power Flow Through Transmission Line, Power Flow capability and Surge Impedance Loading, Series and Shunt Compensation of Transmission Line.

Overhead Line Insulators: Insulator Materials, Types of Insulators, Voltage Distribution over Insulator String, Methods of Equalizing the potential.

Mechanical Design of Overhead Transmission Lines: The catenary curve, Sag TensionCalculation, supports at different levels, Stringing chart, sag Template, Equivalent span, Stringing of Conductors, Vibration and Vibration Dampers

Module IV: **(6 hours)**

Method of Symmetrical Components (positive, negative and zero sequences). Balanced andUnbalanced Faults. Representation of generators, lines and transformers in sequencenetworks. Computation of Fault Currents. Neutral Grounding.

Module V: **(10 hours)**

Classification of Distribution Systems, Primary and secondary distribution network, Voltage Drop in DC Distributors, Voltage Drop in AC Distributors, Kelvin's Law, Limitations of Kelvin's Law, Application of Capacitors to Distribution Systems.

Underground Cables: Type and construction, Classification of Cables, Parameters of Single Core Cables, Grading of Cables, Capacitance of Three Core Cable, Comparison of overhead lines with underground Cables, XLPE, PVC Cables.
Power System Earthing: Soil Resistivity, Earth Resistance, Tolerable Step and Touch Voltage, Actual Touch and Step Voltages. Single-wire Earth Return Concept in distribution system.

Books:

[1] J. Grainger and W. D. Stevenson, "Power System Analysis", McGraw Hill Education, 1994.
[2] O. I. Elgerd, "Electric Energy Systems Theory", McGraw Hill Education, 1995.
[3] D. P. Kothari and I. J. Nagrath, "Modern Power System Analysis", McGraw Hill Education, 4th Edition, 2011.
[4] B. M. Weedy, B. J. Cory, N. Jenkins, J. Ekanayake and G. Strbac, "Electric Power Systems", Wiley, 5th Edition, 2012.
[5] C.L.Wadhwa,"Electrical Power Systems", New Age International Publishers, 6th Edition.
[6] A. R. Bergen and V. Vittal, "Power System Analysis", Pearson Education Inc, 1999.

Digital Learning Resources:

Course Name:	Power System Generation Transmission and Distribution
Course Link:	https://nptel.ac.in/courses/108/102/108102047/
Course Instructor:	Prof. D P Kothari, IIT Delhi

Course Name:	Power System Engineering
Course Link:	https://nptel.ac.in/courses/108/105/108105104/
Course Instructor:	Prof. D Das, IIT Kharagpur