LNCT University
Diploma EX, IV Semester Syllabus

POWER SYSTEM - I (DEX-402)

COURSE OUTCOMES:

After Completing the course student should be able to:

CO-1	Understand the layout and working of various types of power plants including thermal, hydro, nuclear, gas, and diesel plants.
CO-2	Calculate the electrical parameters (resistance, inductance and capacitance) of transmission lines for various conductor configurations (solid, stranded, bundled).
CO-3	Evaluate the performance of transmission lines using short, medium and long line models.
CO-4	Understand mechanical design aspects of transmission lines including line supports, insulators, sag and tension calculations and corona phenomena.
CO-5	Compare overhead and underground transmission systems in terms of design insulation, laying techniques and losses.

UNIT I: POWER GENERATION AND INTRODUCTION TO POWER SYSTEMS
Structure and layout types of power plants: Thermal power station - components, working principle. Hydroelectric power station - layout and operation. Nuclear power plant - basic operation and safety, Gas turbine and Diesel power plants, comparison of power plants based on cost, efficiency and suitability. Economics of power generation: load curve, load factor, diversity factor, base load and peak load plants and tariffs for electrical energy.

UNIT II: TRANSMISSION LINE PARAMETERS
Structure of electrical power system (generation to distribution), Transmission line components, Types of conductors: solid, stranded and bundled resistance, inductance and capacitance calculation for single-phase and three-phase lines, symmetrical and unsymmetrical spacing, Influence of earth on capacitance.

UNIT III: TRANSMISSION LINE PERFORMANCE
Classification of transmission lines: short, medium and long. Models: Short line model, Medium line (nominal-T and nominal-π models), Long line, Surge impedance and SIL, Voltage regulation and transmission efficiency, ABCD parameters-determination and applications.

UNIT IV: MECHANICAL DESIGN OF TRANSMISSION LINES, LINE SUPPORTS POLES AND TOWERS - Types and selection, Insulators - types, voltage distribution, string efficiency, Sag and tension calculations, with and without wind and ice loading, supports at equal and unequal heights, ground clearance and conductor spacing. Introduction to corona and factors affecting it.

UNIT V: OVERHEAD VS UNDERGROUND SYSTEMS & HVDC
Comparison of overhead and underground transmission lines, types of underground cables, Insulation, grading and laying methods, losses and testing of cables, Introduction to HVDC transmission, advantages, and types of HVDC links.

List of Suggestive Experiments: -

1. To find breakdown strength of transformer oil.
2. Study of different types of power plants.
3. Study Ferranti effect and determine A, B, C, D parameters of short and medium transmission line.
4. To draw the operating characteristic of IDMT relay.
5. Study of short, medium and ling transmission.
6. To study the characteristics of the operation of Buchholz relay.
7. To study the characteristics of Electromechanical over current relay.
8. To study characteristics of electromechanical earth fault relay.
9. To find out the string efficiency across the string of insulators.
10. To study various effects on transmission line simulator

Reference Books: -

1. Power System Engineering, By I.J. Nagrath and D.P. Kothari.
2. Electric Power Systems, C.L. Wadhwa.
3. Electrical Power Systems, V.K. Mehta and Rohit Mehta.
4. Generation, Distribution and Utilization of Electrical Energy, C.L. Wadhwa.