LNCT University
Diploma EX, VI Semester Syllabus

EHVAC & DC (DEX-602)

COURSE OUTCOMES:

After Completing the course student should be able to:

CO-1	Explain the purpose, scope, and basic components of EHVAC and HVDC systems.
CO-2	Analyse EHVAC line behaviour and apply mitigation techniques for corona and reactive power.
CO-3	Describe the working principles and components of HVDC systems.
CO-4	Identify overvoltage types and apply insulation and grounding coordination methods.
CO-5	Evaluate EHV system designs and their environmental implications.

UNIT I: INTRODUCTION TO EHV TRANSMISSION

Need for EHV transmission. Advantages and limitations of EHVAC and HVDC systems. Voltage levels and power capacity in EHV systems. Comparison between HVAC and HVDC transmission. Components of EHV transmission systems.

UNIT II: EHVAC TRANSMISSION

Line parameters (resistance, inductance, capacitance) of EHV lines. Voltage gradient and electric field around conductors. Corona phenomenon: causes, effects, and minimization techniques. Insulation coordination and electrostatic field control. Reactive power compensation and control in EHVAC systems.

UNIT III: HVDC TRANSMISSION

Principles of HVDC transmission. Types of HVDC links: monopolar, bipolar, back-to-back. HVDC system components: converters, filters, smoothing reactors. Converter station layout and operation. Control of HVDC systems: constant current and constant extinction angle control. HVDC circuit breakers (basic concept).

UNIT IV: OVERVOLTAGE AND INSULATION COORDINATION

Types of over voltages: internal and external. Lightning and switching over voltages. Protection against over voltages: surge arresters, shielding. Basic concepts of insulation coordination in EHV systems. Grounding techniques and neutral grounding in EHV systems.

UNIT V: EHV SYSTEM DESIGN AND APPLICATIONS

Conductor configuration and tower design for EHVAC and HVDC lines. Environmental impact of EHV systems: audible noise, radio interference. Right-of-way (ROW) and electromagnetic interference (EMI). Use of EHV systems in grid interconnection and bulk power transmission. Recent developments in UHV (Ultra High Voltage) and multi-terminal HVDC systems.

List of Suggestive Experiments: -

1. Case study or presentation on the need for EHV transmission in modern power systems.
2. Comparative chart of EHVAC vs. HVDC transmission based on voltage level, cost, losses, and application.
3. Identification of components of EHV transmission systems using diagrams/models.
4. Study of insulation coordination and use of grading rings and shielding techniques.
5. Analysis of reactive power compensation using shunt capacitors/reactors and their effect on voltage regulation.
6. Block diagram study of HVDC transmission types: monopolar, bipolar, back-to-back.
7. Study of switching surges and protection methods using surge arresters.
8. Analysis of shielding angle and tower top geometry for effective lightning protection.
9. Study of audible noise and radio interference in EHV transmission and mitigation techniques.
10. Activity on EMI and ROW (Right of Way) calculation for transmission corridors.

Reference Books: -

1. Extra High Voltage AC Transmission Engineering, R. D. Begamudre.
2. HVDC Power Transmission Systems, K. R. Padiyar.
3. High Voltage Engineering, M. S. Naidu & V. Kamaraju.
4. Electric Power Systems, C. L. Wadhwa.