
**HIGH VOLTAGE DC TRANSMISSION
(ELECTIVE-I)****Course Code:13EE2207****L P C
4 0 3**

Pre requisites: Basic knowledge of Power Transmission system, Power Electronics and Switchgear & Protection

Course Educational Objectives:

To impart the students with different technologies available for High Voltage Power System and also different control strategies for efficient operation of the power system under normal and abnormal conditions.

Course Outcomes: After completion of this Course, the student will be able to

1. Understand the complete operation of HVDC Converter stations
2. Understand the power flow control on HVDC Transmission system
3. Understand the Operation of the controller for HVDC in worst and normal operations
4. Analyze the AC / DC system interactions

UNIT-I**H.V.D.C. TRANSMISSION & STATIC POWER CONVERTERS:**

General considerations, Power Handling Capabilities of HVDC Lines, Basic Conversion principles, static converter configuration, 3-pulse, 6-pulse and 12-pulse converters, converter station and Terminal equipment, commutation process, Rectifier and inverter operation, equivalent circuit for converter special features of converter transformer

UNIT-II

HARMONICS IN HVDC SYSTEMS & CONTROL OF HVDC CONVERTERS AND SYSTEMS: Harmonics in HVDC Systems,

Harmonic elimination, AC and DC filters. Control of HVDC Converters and systems: constant current, constant extinction angle and constant Ignition angle control. Individual phase control and equidistant firing angle control, DC power flow control.

UNIT-III

INTERACTION BETWEEN HV AC AND DC SYSTEMS: Voltage interaction, Harmonic instability problems and DC power modulation.

UNIT-IV

MTDC SYSTEMS: Multi-terminal DC links and systems; series, parallel and series parallel systems, their operation and control.

UNIT-V

TRANSIENT OVER VOLTAGES IN HVDC SYSTEMS & CONVERTER FAULTS AND PROTECTION IN HVDC SYSTEMS: Over voltages due to disturbances on DC side, over voltages due to DC and AC side line faults, Converter faults, over current protection - valve group, and DC line protection. Over voltage protection of converters, Surge Arresters.

TEXT BOOKS:

1. E.W. Kimbark, “*Direct current Transmission*”, Wiley Inter Science , New York, 1971. (Chapter 1,2 and 5)
2. J.Arillaga, “*H.V.D.C.Transmission*”, Peter Peregrinus ltd., London UK 1983.
3. K.R.Padiyar, “*High Voltage Direct current Transmission*”, Wiely Eastern Ltd., New Delhi, 1992. (Chapter-3,4)

REFERENCE BOOKS:

1. E.Uhlman, “*Power Transmission by Direct Current*”, Springer Verlag, Berlin Helberg ,1985.
2. S Rao, “*EHV-AC & HVDC Transmission Engineering &Practice*”, Khanna Publishers, Second Edition 1996.