HIGH VOLTAGE DC TRANSMISSION
(ELECTIVE-I)

Course Code:13EE2207 **L P C**
4 0 3

Pre requisites: Power Transmission Engineering,
Power Electronics and Switchgear & Protection

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

CO1: Analyze the complete operation of HVDC Converter stations
CO2: Analyze the harmonics behavior and Control of HVDC System
CO3: Analyze the interaction of HVAC and HVDC system
CO4: Analyze Series and Parallel MTDC and its Control
CO5: Analyze Over Voltage and Over Current Protection Schemes.

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 , NewYork,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.