M.TECH FIRST SEMESTER

EEPC1T2 **H.V.D.C. TRANSMISSION** **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 30 marks**
Semester end examination: 70 marks

Objective: The importance of HVDC transmission

- Analysis of HVDC converters
- Harmonics and filters in HVDC system
- MTDC system
- Faults and protection

Learning outcomes:

- Examine key economics and technical drivers for new HVDC system
- Review system planning considerations for HVDC transmission
- Examine the technical aspects and application of MTDC system

Faults and protection of HVDC system

Unit 1 :H.V.D.C. Transmission : General considerations, Power Handling Capabilities of HVDC Lines, Basic Conversion principles, static converter configuration.

Unit 2 : Static Power Converters : 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 transformers.

Unit 3 : Harmonics in HVDC Systems, Harmonic elimination, AC and DC filters.

Unit 4 : 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 5 : Interaction between HV AC and DC systems – Voltage interaction, Harmonic instability problems and DC power modulation.

Unit 6 : Multi-terminal DC links and systems; series, parallel and series parallel systems, their operation and control.

Unit 7 : Transient over voltages in HV DC systems : Over voltages due to disturbances on DC side, over voltages due to DC and AC side line faults

Unit 8: Converter faults and protection in HVDC Systems: Converter faults, over current protection - valve group, and DC line protection, circuit breakers. Over voltage protection of converters, surge arresters.

Reference Books :

1. K.R.Padiyar : High Voltage Direct current Transmission, Wiley Eastern Ltd., New Delhi – 1992.
2. E.W. Kimbark : Direct current Transmission, Wiley Inter Science – New York.
3. J.Arillaga : H.V.D.C.Transmission Peter Peregrinus ltd., London UK 1983
4. E.Uhlman : Power Transmission by Direct Current, Springer Verlag, Berlin Helberg – 1985.