

| Course Type | Course Code | Name of Course | L | T | P | Credit |
|-------------|-------------|-----------------------------|---|---|---|--------|
| DC | NEEC503 | HVDC Transmission and FACTs | 3 | 1 | 0 | 4 |

Course Objective

- To educate the students about the recent methods of DC transmission, its applicability and possibility of HVAC transmission with HVDC. Also to familiarize the students about the use of flexible ac transmission devices in power transmission to cater the increasing load demand without expansion of transmission network.

Learning Outcomes

- To aware the students about the possibility of introduction of HVDC system into the current power transmission network. Also how power electronic based devices enhances the transmission capacity and efficiency without expansion of transmission network is another major issue to be appraised.

| Unit No. | Topics to be Covered | Lecture+ Tutorial Hours | Learning Outcome |
|----------------------------|---|-------------------------|--|
| 1 | General aspects of DC Transmission and its application; types of DC link; MTDC transmission: series, parallel; comparative analysis of HVAC and HVDC system | 9L+3T | Understanding of different DC transmission techniques and their utilities. |
| 2 | Converter control characteristics; DC power flow control mechanism; Harmonic elimination; AC and DC filters | 8L+3T | Understanding of converter control operations, DC power flow and filters |
| 3 | DC circuit breaker; transients and over-voltages in DC; insulators | 8L+3T | Understanding of the operation of DC circuit breaker, effect of transients on HVDC transmission. |
| 4 | Basic concepts of FACTS; different types of FACTS controllers and their needs in electric power transmission; Series Compensation – objective of series compensation, thyristor switch series capacitor (TCSC), static series synchronous compensator (SSSC); Shunt Compensation – objective of shunt compensation, Static-Var Compensator (SVC), Static compensator (STATCOM), performance analysis of SVC and STATCOM | 10L+2T | Understanding of the operation of different types of FACTS devices, improvement of steady state stability and transient stability limit, reactive power compensation with FACTS devices. |
| 5 | Combined compensator: Unified power flow controller (UPFC), phase angle regulator (PAR), Thyristor controlled phase shifter (TCPST), Thyristor controlled voltage angle regulator (TCVAR) | 7L+3T | Understanding of versatile operation of modern types of FACTS devices. |
| Total Contact Hours | | 42L+14T | |

Text Books:

- Padiyar, K. R. *HVDC power transmission systems: technology and system interactions*. New Age International, 1990.

Reference Books

- Hingorani, Narain G., Laszlo Gyugyi. *Understanding FACTS: concepts and technology of flexible AC transmission systems*. Vol. 1. New York: IEEE press, 2000.