

4/4 B.Tech. FIRST SEMESTER

EE7T2

HVDC TRANSMISSION

Credits : 4

Lecture : 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Objectives:

This subject deals with the importance of HVDC transmission, analysis of HVDC converters, Faults and protections, Harmonics and Filters and MTDC systems.

Learning outcomes:

1. Examine key economic and technical drives for new HVDC projects
2. Review system planning considerations for HVDC transmission
3. Evaluate the value proposition for using HVDC to carry low cost high capacity wind energy load centres
4. Discuss new advances in HVDC technology and their applications
5. Analyze design and construction factors for HVDC projects
6. Examine the technical aspects and application of multi terminal HVDC system

Unit I General Aspects of HVDC Transmission

D. C. Power Transmission Technology, Introduction, Comparison of AC and DC Transmission, Application of DC Transmission, Description of DC Transmission System, Planning for HVDC transmission, Modern Trends in DC transmission.

Unit II HVDC Converters

HVDC Converters, Choice of converter configuration, Simplified analysis of Graetz circuit, Converter bridge characteristics, Characteristics of a twelve pulse converters, Detailed analysis of converters.

Unit III HVDC System Control

Principal of DC Link Control, Converters Control Characteristics, System Control Hierarchy, Firing angle control, Current and extinction angle control, Starting and stopping of DC link; Power Control.

Unit IV Reactive Power Control In HVDC System

Reactive Power Requirements in steady state, Conventional control strategies, Alternate control strategies, sources of reactive power.

Unit V Converter Faults & Protection

Introduction, Converter faults, Protection against over currents and over voltages in a converter station, Surge arrests, Protection against over Voltages, Surge arresters, Smoothing Reactor.

Unit VI Multiterminal DC Systems

Introduction, Potential applications of MTDC systems, Types of MTDC systems, control and protection of MTDC systems.

Unit VII Harmonics

Generation of harmonics, Causes of harmonics, Characteristics harmonics, calculation of AC Harmonics, Non- Characteristics harmonics, Adverse effects of harmonics.

Unit VIII Filters

Types of AC filters, Design of Single tuned filters, Design of high pass filter, Analysis of double tuned filter.

Learning resources

Text books:

1. HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited, and Publishers.
2. EHVAC and HVDC Transmission Engineering and Practice – S.Rao.

Reference books:

1. HVDC Transmission – J.Arrillaga.
2. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons.
3. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications.