H.V.D.C. TRANSMISSION
(Professional Elective-V)

Course Code: 15EE1143

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Pre-requisites:

Power Electronics and Power Transmission Engineering.

Course Outcomes:

At the end of the Course, the Student will be able to:

CO 1 Analyze different types of DC links

CO 2 Analyze Graetz bridge with and without overlap

CO 3 Describe Converter control characteristics

CO 4 Explain different converter faults and protection

CO 5 Analyze generation of Harmonics and filters

UNIT-I **(10 Lectures)**

BASIC CONCEPTS:

Comparison of AC and DC Transmission-Economics of power transmission-Technical performance-Reliability, Application of DC transmission, Description of DC transmission system-Types of DC links-Converter station, planning for HVDC transmission, Modern trends in HVDC technology, Some operating problem, HVDC transmission based on Voltage Source Inverter.

UNIT-II **(10 Lectures)**

ANALYSIS OF LINE COMMUTATED HVDC CONVERTERS:

Introduction, Analysis of Graetz bridge – Analysis of two valve conduction mode, Analysis of two and three valve conduction mode, relationship between AC and DC quantities-equivalent circuit of rectifier, Inversion-equation of average direct current and voltage in terms of β and γ –equivalent circuit of inverter, Analysis of 12 Pulse converters.

UNIT-IIII (10 Lectures)

HVDC SYSTEM CONTROL:

Principle of DC link control, Converter control characteristics-, System control hierarchy , firing angle control-IPC-EPC, current and extinction angle control Starting and stopping of DC link, power control.

UNIT-IV (10 Lectures)

CONVERTER FAULT &PROTECTION:

Converter faults – protection against over current, Over voltages in a converter station-protection against over voltage in converter station – surge arresters – smoothing reactors – DC breakers.

MULTITERMINAL DC SYSTEMS:

Potential application of MTDC Systems, Types of MTDC systems, Comparison of series and parallel MTDC systems.

UNIT-V (10 Lectures)

HARMONICS & FILTERS :

Introduction, Generation of Harmonics –Characteristics harmonics, calculation of characteristics AC Harmonics, DC voltage harmonics, Types of AC filters, Passive AC and DC filters, Active filters.

TEXT BOOK:

K.R. Padiyar: HVDC Power Transmission System, 2nd Edition, New Age International Publishers, 2012.

REFERENCES:

1. Erich Uhlmann, “Power Transmission by Direct Current, Fourth Indian Reprint Springer International Edition, 2012.
2. S Kamakshaiah, V Kamaraju : “HVDC Transmission”, 1st Edition, Mcgraw Hill Education, 2011.
3. E.W.Kimbark : “Direct Current Transmission”, Wiley InterScience, New York, 1971.
4. J Arrillaga, “H.V.D.C Transmission”, Peter Peregrinus Ltd., London UK 1983.