

III B.Tech – II Semester
(20EE6319) HIGH VOLTAGE ENGINEERING

Int. Marks	Ext. Marks	Total Marks	L	T	P	C
30	70	100	3	-	-	3

Pre-Requisites: Applied Physics, Power Systems – II.

Course Objectives

- To understand the electric field distribution and computation in different configuration of electrode systems.
- To study the HV breakdown phenomena in gases, liquids and solids dielectrics.
- To provide adequate knowledge on the generation of high voltages and currents.
- To understand the measurement of high voltages and currents and insulating characteristics of dielectric materials.
- To study the various testing techniques of HV equipment.

UNIT-I: High Voltage Terminology & Concepts

Introduction - Static dielectric constant – Polarization and dielectric constant - Electric Field Stresses – Uniform and non-uniform field configuration of electrodes – Estimation and control of electric Stress – Numerical methods for electric field computation.

UNIT-II: Break down Mechanism in gaseous, liquid and solid insulation

Behaviour of gaseous dielectrics in electric fields – gaseous discharges – different ionization processes – effect of electrodes on gaseous discharge – Townsend's theory, Streamer theory – Liquid as Insulator – Pure and commercial liquids – Breakdown in pure and commercial liquid – Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown – Breakdown of solid dielectrics, composite dielectrics used in practice.

UNIT-III: Generation of High voltages and High currents

Generation of high DC voltages – Generation of high alternating voltages – Generation of impulse voltages and currents – Tripping and control of impulse generators.

UNIT-IV: Measurement of High voltages and High currents

Measurement of high AC, DC and Impulse voltages – Voltages and measurement of high currents – Direct, alternating and Impulse. Measurement of DC resistivity – Measurement of dielectric constant and loss factor – Partial discharge measurements.

UNIT-V: High voltage testing of electrical apparatus

Testing of insulators and bushings – Testing of isolators and circuit breakers – Testing of cables – Testing of transformers – Testing of surge arresters – Radio interference measurements.

Course Outcomes:

After successful completion of the course, the students will be able to:

S.No	Course Outcome	BTL
1.	Ability to understand the performance of high voltages with regard to different configurations of electrode systems.	L2
2.	Ability to know the theory of breakdown and withstand phenomena of all types of dielectric materials.	L1
3.	Ability to apply knowledge for generation of high voltage and high current AC, DC and Impulse.	L3
4.	To be in a position to measure dielectric property of material used for HV equipment.	L2
5.	To know the techniques of testing various equipments used in HV engineering.	L1

Correlation of COs with POs& PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2										3	2
CO2	3	2		2									3	2
CO3	3	3			2	2							2	2
CO4	2	2	1	1									2	1
CO5	3	2			2								3	2

Text Books:

1. High Voltage Engineering: Fundamentals by E. Kuffel, W. S. Zaengl, J. Kuffel by Elsevier, 2nd Edition.
2. High Voltage Engineering and Technology by Ryan, IET Publishers.
3. Dieter Kind, Kurt Feser, "High Voltage Test Techniques", SBA Electrical Engineering Series, New Delhi, 1999.
4. High Voltage Engineering by C.L. Wadhwa, New Age International (P) Limited, 1997.

Reference Books:

1. High Voltage Engineering by M. S. Naidu and V. Kamaraju-TMH Publications, 3rd Edition
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New Age International (P)Limited,1995
3. Dieter Kind, Kurt Feser, "High Voltage Test Techniques", SBA Electrical Engineering Series, New Delhi, 1999.