

HIGH VOLTAGE ENGINEERING

Course Code	23EE4602C	Year	III	Semester	II
Course Category	Professional Elective -III	Branch	EEE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	ECA, EM&I
Continuous Internal Evaluation:	30	Semester End Evaluation:	70	Total Marks:	100

Course Outcomes	
Upon successful completion of the course, the student will be able to	
CO1	Understand the concepts of dielectric breakdown, and the principles of high voltage generation and measurement (L2).
CO2	Apply breakdown concepts in gaseous, liquid, and solid insulations (L3).
CO3	Analyze circuits and methods for generating high AC, DC, and impulse voltages and currents (L4).
CO4	Apply suitable methods to measure high AC, DC, and impulse voltages and currents (L3).
CO5	Ability to understand the concepts of high voltage engineering and submit a report.

Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:High, 2: Medium, 1:Low)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1														
CO2	3		2			3							3	3
CO3		3	3	3									3	3
CO4	3			3								2	3	3
CO5									3	3			3	3

SYLLABUS		
Unit No.	Contents	Mapped CO
I	Break down phenomenon in Gaseous and Vacuum: Insulating Materials: Types, properties and its applications. Gases as insulating media – Collision process – Ionization process – Townsend's criteria of breakdown in gases and its limitations – Streamers Theory of break down – time lag – Paschen's law- Paschen's curve, Penning Effect. Breakdown mechanisms in Vacuum.	CO1 CO2 CO5
II	Break down phenomenon in Liquids: Liquid as Insulator – Pure and commercial liquids – Breakdown in pure and commercial liquids- Mechanisms. Break down phenomenon in Solids: Intrinsic breakdown – Electromechanical breakdown – Thermal breakdown – Breakdown of composite solid dielectrics.	CO1 CO2 CO5

III	Generation of High DC voltages: Voltage Doubler Circuit - Voltage Multiplier Circuit – Vande- Graaff Generator. Generation of High AC voltages: Cascaded Transformers – Resonant Transformers –Tesla Coil.	CO1 CO3 CO5
IV	Generation of Impulse voltages: Specifications of impulse wave – Analysis of RLC circuits - Marx Circuit. Generation of Impulse currents: Definitions – Circuits for producing Impulse current waves – Wave shape control - Tripping and control of impulse generators.	CO1 CO3 CO5
V	Measurement of High DC & AC Voltages: Resistance potential divider - Generating Voltmeter - Capacitor Voltage Transformer (CVT) - Electrostatic Voltmeters – Sphere Gaps. Measurement of Impulse Voltages & Currents: Potential dividers with CRO - Hall Generator - Rogowski Coils.	CO1 CO4 CO5

Learning Resources	
Text Books:	
1. High Voltage Engineering: Fundamentals by E.Kuffel - W.S.Zaengl - J.Kuffel by Elsevier - 2 nd Edition. 2. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications - 3 rd Edition	
Reference Books:	
1. High Voltage Engineering and Technology by Ryan - IET Publishers - 2 nd edition. 2. High Voltage Engineering by C.L.Wadhwa - New Age International (P) Limited – 1997. 3. High Voltage Insulation Engineering by RavindraArora - Wolfgang Mosch - New Age International (P) Limited - 1995	
E-Resources:	
1. https://archive.nptel.ac.in/courses/108/104/108104048 2. https://bharatsrajpurohit.weebly.com/high-voltage-engineering-course.html	