

**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY
HYDERABAD**

IV Year B.Tech EEE I-Sem

T P C
4+1* 0 4

HIGH VOLTAGE ENGINEERING

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SL. No.	Name of The Topic	No. of Classes Required	Cumulative number of Periods
Unit - I : INTRODUCTION TO HIGH VOLTAGE TECHNOLOGY AND APPLICATIONS			
1	Introduction to High voltage Engineering and their applications, Objectives and Relevance of Subject	2	2
2	Electric field stress, Gas/Vaccum as emulator, Liquid dielectric, Solids & Composite dielectrics	1	3
3	Estimation and Control of electric stress	2	5
4	Numerical Methods for Electric field computation Finite element method	1	6
5	Charge simulation Method, Boundary element method	2	8
6	Numerical Problems	2	10
7	Surge voltage their distribution, Application of Insulating materials in transformers, Application of Insulating materials in rotating machines	2	12
8	Application of Insulating materials in circuit breakers, Application of Insulating materials in cables, Power capacitors and Bushings.	1	13
9	TUTORIAL CLASSES	2	15
Unit-II BREAK DOWN IN DIELECTRIC MATERIAL			
10	Gases as Insulating media, Collision process,	1	16
11	Ionization Process, Ionization by collision – photo ionization, Secondary ionization process – Electron attachment process	1	17
12	Townsend's criterion of breakdown in gases, Townsend's current growth equation – current growth in the presence of secondary process, Townsend criterion for breakdown	1	18
13	Experimental Determination of coefficients α and γ	1	19
14	Streamer theory of breakdown in gases, paschen's law	1	20
15	Liquids as Insulators, Classification of liquid dielectrics and characteristics	1	21
16	Pure and commercial liquids, Breakdown tests, conduction and breakdown in pure liquids	1	22
17	Conduction and Breakdown in Pure & Commercial liquids, Suspended particle theory, Cavitation and bubble theory, Stressed oil volumes theory	1	23
18	Introduction, Intrinsic Breakdown, Electronic Breakdown, Avalanche or Streamer Breakdown	1	24
19	Electromechanical breakdown, Thermal Breakdown	1	25

20	Breakdown of solid dielectrics in practice, Chemical and Electrochemical deterioration and breakdown, Breakdown due to treeing and tracking	1	26
21	Breakdown due to internal discharges, Breakdown in Composite dielectrics, properties of composite dielectrics, Mechanism of breakdown in composite dielectrics	1	27
22	Solid dielectrics used in practice, paper , fibers, paper ,fibers, Glass ,ceramics and plastics, Nylon , polyvinyl chloride and polyesters	1	28
UNIT III			
GENERATION AND MEASUREMENT OF HIGH VOLTAGES AND CURRENTS			
24	Generation of high dc voltages	1	31
25	Generation of high ac voltages	1	32
26	Generation of high impulse voltages	2	34
27	Generation of high impulse currents	1	35
28	Measurement of high dc voltages	2	37
29	Measurement of high ac voltages	1	38
30	Measurement of high impulse voltages	1	39
31	Measurement of high impulse currents	1	40
32	Oscilloscope for impulse voltages and current measurements	1	41
33	Tutorialclasses	2	43
Unit IV			
OVER VOLATGES AND INSULATION COORDINATION			
34	Natural causes for overvoltages- Lightning phenomena, Charge formation in the clouds, Rate of changing of thunder clouds	2	45
35	Mechanism of lighting strokes, parameters and characteristics of the lightning strokes	1	46
36	Mathematical model for lighting, Travelling Waves on transmission lines	2	48
37	Classification of transmission lines ,attenuation and distortion of travelling wave, reflection and transmission of waves	1	49
38	Behaviour of Rectangular Travelling Wave	2	51
39	Overvoltage due to Switching Surges, Systems faults & other abnormal conditions.	1	52
40	Protection against Lightning Overvoltages and switching surges of short duration	1	53
41	Principles of Insulation coordination on High Voltage and Extra High Voltage Power systems, Surge arresters, Equipment insulation level and insulation coordination of substations, With protective zones, Insulation coordination in EHV & UHV systems.	1	54
42	TUTORIAL CLASSES	2	56
UNIT V			
TESTING OF MATERIALS & ELECTRICAL APPARATUS			
43	Testing on Insulators and Bushings: Definitions, Tests on Insulators: Power Frequency Tests, Impulse Tests	3	59
44	Testing of Bushings: Power frequency tests, Impulse Voltage tests, Thermal tests.	3	62

45	Testing of Isolators and Circuit Breakers, Introduction, Short circuit tests	2	64
46	Testing of Cables, Partial Discharges,	2	66
47	Testing of Transformers, Testing of Surge Arresters,	1	67
48	Radio Interference Measurements	1	68
	TUTORIAL CLASSES	2	70
49	Descriptive Tests	2	72
50	Remedial Classes/NPTL / Gaps in the syllabus / Classes for beyond syllabus	3	75
TOTAL CLASSES			75

