

HIGH VOLTAGE ENGINEERING

VII Semester: EEE																																			
Course Code	Category	Hours / Week			Credits	Maximum Marks																													
AEE015	Core	L	T	P	C	CIA	SEE	Total																											
		3	1	-	4	30	70	100																											
Contact Classes: 45		Tutorial Classes: 15		Practical Classes: Nil			Total Classes: 60																												
<p>I. COURSE OVERVIEW: This course enables Planning, operation and Testing of High voltage Electrical devices. High voltage engineering deals with different mediums of insulation and break down Phenomenon, generation of high DC and AC voltage, measurement Techniques of high AC and DC voltages, testing of insulation under all types of conditions using generated high DC and AC voltages.</p> <p>II. OBJECTIVES: The course should enable the students to:</p> <ul style="list-style-type: none"> I The breakdown phenomena in gas, liquid and solid dielectric materials used in the high voltage devices. II The circuit design and operation for generation of high DC, AC and impulse voltages. III The different methods for measurement and testing of equipments used in the high voltage engineering. <p>III. COURSE OUTCOMES: After successful completion of the course, students should be able to:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 80%;">CO 1 Infer the protection methods against over voltages and working of lightning arrester for protecting various equipments in power system.</td> <td style="width: 20%;">Understand</td> </tr> <tr> <td>CO 2 Illustrate the breakdown phenomena of various types of dielectric materials to measure their strength in an insulating medium.</td> <td>Understand</td> </tr> <tr> <td>CO 3 Explain the methods of generation of impulse voltage and currents for controlling and triggering of impulse generators.</td> <td>Understand</td> </tr> <tr> <td>CO 4 Apply analytical and numerical techniques of measuring voltages and currents accurately calculations in high voltage systems.</td> <td>Apply</td> </tr> <tr> <td>CO 5 Make use of various nondestructive test techniques used for testing of high voltage electrical apparatus.</td> <td>Apply</td> </tr> <tr> <td>CO 6 Outline the principles of insulation co-ordination on high voltage and Extra high voltage power systems for suppressing the over voltages</td> <td>Understand</td> </tr> </table> <p>IV. SYLLABUS:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">UNIT - I</td> <td style="width: 65%;">OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS</td> <td style="width: 20%; text-align: right;">Classes: 09</td> </tr> <tr> <td colspan="3">Origin of over voltages: Causes of over voltages and their effects on power system, lightning, switching surges and temporary over voltages, corona and its effects, reflection and refraction of travelling waves, protection against over voltages.</td> </tr> <tr> <td>UNIT - II</td> <td>DIELECTRIC BREAKDOWN</td> <td style="text-align: right;">Classes: 09</td> </tr> <tr> <td colspan="3">Breakdown of dielectrics: Gaseous breakdown in uniform and non uniform fields, corona discharges, breakdown of vacuum, conduction and breakdown in pure and commercial liquids, maintenance of oil quality, breakdown mechanisms in solid and composite dielectrics.</td> </tr> <tr> <td>UNIT - III</td> <td>GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS</td> <td style="text-align: right;">Classes: 09</td> </tr> </table>									CO 1 Infer the protection methods against over voltages and working of lightning arrester for protecting various equipments in power system.	Understand	CO 2 Illustrate the breakdown phenomena of various types of dielectric materials to measure their strength in an insulating medium.	Understand	CO 3 Explain the methods of generation of impulse voltage and currents for controlling and triggering of impulse generators.	Understand	CO 4 Apply analytical and numerical techniques of measuring voltages and currents accurately calculations in high voltage systems.	Apply	CO 5 Make use of various nondestructive test techniques used for testing of high voltage electrical apparatus.	Apply	CO 6 Outline the principles of insulation co-ordination on high voltage and Extra high voltage power systems for suppressing the over voltages	Understand	UNIT - I	OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS	Classes: 09	Origin of over voltages: Causes of over voltages and their effects on power system, lightning, switching surges and temporary over voltages, corona and its effects, reflection and refraction of travelling waves, protection against over voltages.			UNIT - II	DIELECTRIC BREAKDOWN	Classes: 09	Breakdown of dielectrics: Gaseous breakdown in uniform and non uniform fields, corona discharges, breakdown of vacuum, conduction and breakdown in pure and commercial liquids, maintenance of oil quality, breakdown mechanisms in solid and composite dielectrics.			UNIT - III	GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS	Classes: 09
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High AC, DC voltages and currents: Generation of high DC, AC and impulse voltages and currents. Triggering: Triggering and control of impulse generators.		
UNIT - IV	MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS	Classes: 09
High voltage and current measurement: High resistance with series ammeter, dividers, resistance, capacitance and mixed dividers, peak voltmeter, generating voltmeters, capacitance voltage transformers, electrostatic voltmeters, sphere gaps, high current shunts, digital techniques in high voltage measurement.		
UNIT - V	HIGH VOLTAGE TESTING AND INSULATION COORDINATION	Classes: 09
Testing: High voltage testing of electrical power apparatus as per international and Indian standards, power frequency, impulse voltage and dc testing of insulators, circuit breakers, bushings, isolators and transformers, insulation coordination.		
Text Books:		
<ol style="list-style-type: none"> 1. S Naidu, V Kamaraju, "High Voltage Engineering", Tata McGraw-Hill, 5th Edition, 2013. 2. E Kuffel, W S Zaengl, J Kuffel, "High voltage Engineering fundamentals", Newnes, 2nd Edition Elsevier, New Delhi, 2005. 3. Subir Ray, "An Introduction to High Voltage Engineering", PHI Learning Private Limited, New Delhi, 2nd Edition, 2013. 		
Reference Books:		
<ol style="list-style-type: none"> 1. L L Alston, "High Voltage Technology", Oxford University Press, 1st Indian Edition, 2011. 2. C L Wadhwa, "High Voltage Engineering", New Age International Publishers, 3rd Edition, 2010. 		
Web References:		
<ol style="list-style-type: none"> 1. https://www.nptel.ac.in/courses/108104048/ 2. https://www.hve.iisc.ernet.in/ 3. https://www.ee.iisc.ac.in/research-hve.php 4. https://www.wikipedia.org/wiki/High_voltage 5. https://www.annauniv.edu/HighVoltage/ 		
E-Text Books:		
<ol style="list-style-type: none"> 1. https://www.docs.google.com/file/d/0B5vXY4-Kg5GeQi1LcEU2UnJNbE0/edit 2. https://www.7see.blogspot.in/2015/04/high-voltage-engineering-by-wadhwa-free.html 3. https://www.itebooks.zone/1849192634.html 4. https://www.studynama.com/community/threads/329-High-voltage-engineering-ebook-pdf-lecture-notes-download-for-electrical 		
Course Home Page:		