EE606105-HIGH VOLTAGE ENGINEERING								
Course	Course Type: Theory	L	T	P	C			
Category:		3	0	0	3			
<b>Program Elective</b>				Ů				
COURSE OBJECTIVES:								

To impart knowledge on the following Topics

- Various types of over voltages in power system and protection methods.
- Generation of over voltages in laboratories.
- Measurement of over voltages.
- Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- Testing of power apparatus and insulation coordination

## UNIT-I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS

9

Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages, Corona and its effects – Bewley lattice diagram- Protection against

over voltages.

## UNIT-II DIELECTRIC BREAKDOWN

9

Properties of Dielectric materials - Gaseous breakdown in uniform and non-uniform fields - Corona discharges - Vacuum breakdown - Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality - Breakdown mechanisms in solid and composite dielectrics- Applications of insulating materials in electrical equipment.

#### UNIT- III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS

9

Generation of High DC voltage: Rectifiers, voltage multipliers, vandigraff generator: generation of high impulse voltage: single and multistage Marx circuits – generation of high AC voltages: cascaded transformers, resonant transformer and tesla coil- generation of switching surges – generation of impulse currents - Triggering and control of impulse generators.

### UNIT -IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS

9

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 5: HIGH VOLTAGE TESTING & INSULATION COORDINATION**

9

High voltage testing of electrical power apparatus as per International and Indian standards

- Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination& testing of capabilities

**TOTAL: 45 PERIODS** 

**COURSE OUTCOMES:** At the end of the course, the student will be able to

CO1: Ability to understand Generation and measurement of high voltage.

CO2: Ability to understand High voltage testing.

CO3: Ability to understand various types of over voltages in power system.

CO4: Ability to measure over voltages.

CO5: Ability to test power apparatus and insulation coordination

### **CO-PO MAPPING**

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

### **TEXT BOOKS:**

- 1. 1. S.Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.
- 2. E. Kuffel and W.S. Zaengl, J.Kuffel, 'High voltage Engineering fundamentals', Newnes Second Edition Elsevier, New Delhi, 2005.
- 3. C.L. Wadhwa, 'High voltage Engineering', New Age International Publishers, Third Edition, 2010.

## **REFERENCE BOOKS:**

- 1. "L.L. Alston, 'High Voltage Technology', Oxford University Press, First Indian Edition, 2011.
- 2. Mazen Abdel Salam, Hussein Anis, Ahdab A-Morshedy, Roshday Radwan, High Voltage Engineering Theory & Practice, Second Edition Marcel Dekker, Inc., 2010.
- 3. Subir Ray,' An Introduction to High Voltage Engineering' PHI Learning Private Limited, New Delhi, Second Edition, 2013.

# WEB RESOURCES:

- 1. High voltage DC Transmission https://archive.nptel.ac.in/courses/108/104/108104013/
- 2. Generation of High Test voltages https://archive.nptel.ac.in/courses/108/104/108104048/