

**Course Title: High Voltage Engineering**

**Course Code: EPEG 409**

**Credit Hours: 3**

**Course Description:**

This course intends to examine the peculiarities of high voltage transmission and plant equipment from a theoretical and practical viewpoint

**Course Contents:**

**Unit 1: Review of Electromagnetic Field Theory**

Electrostatic potential difference and potential gradient; Conducting and dielectric materials in electric fields; Polarization, capacitance, and leakage conductance of dielectrics

**Unit 2: Electrical Breakdown in Gases**

Gases as insulating media, Ionization process, and Townsend's current growth equation; Current growth in the presence of secondary process; Townsend's criteria for breakdown and determination of coefficients 'a' & 'g'; Breakdown in electronegative gases, Time lags for breakdown, Streamer theory of breakdown in gases, and Paschen's law; Corona effect, Surge effects, Post-breakdown phenomena and applications; Practical considerations in determining insulation applications

**Unit 3: Electrical Breakdown in Liquid Dielectrics**

Pure and commercial liquids; Conduction and breakdown in pure liquids and commercial liquids

**Unit 4: Electrical Breakdown in Solid Dielectrics**

Introduction, Intrinsic breakdown, and electromechanical breakdown; Thermal breakdown and breakdown of solid dielectrics in practice; Breakdown of composite insulation and solid dielectrics used in practice

**Unit 5: Generation of High Voltage and Currents**

Generation of high voltage DC, high voltage AC and generation of impulse voltage; Generation of impulse currents; Tripping and control of impulse generator

**Unit 6: Measurement of High Voltage and Currents**

Measurement of DC, AC and impulse high voltages; Measurement of DC, AC, and impulse high currents; Cathode ray oscillographs for impulse voltage and current measurements

**Unit 7: Overvoltage Phenomenon and Insulation Coordination in Electric Power System**

Natural cause- lightning phenomenon, Switching overvoltage/power frequency; Overvoltage in power system; Insulation coordination on high voltage and extra high voltage power systems

**Unit 8: High Voltage Non-Destructive Testing**

Introduction, Measurement of DC resistivity, dielectric constant and loss factor; Partial discharge measurement

### **Unit 9: High Voltage Testing of Electrical Apparatus**

Insulators and bushings, isolators and circuit breakers; Cables, transformers, and surge diverters; Radio interference measurements.

### **Unit 10: Application of Insulating Materials**

Application in power transformers, rotating machines, circuit breakers; Cables, power capacitors, and electronic equipment.

### **References:**

1. M. S. Naidu and V. Kamaraju, *High Voltage Engineering*, Tata McGraw Hill, 1982

### **Evaluation:**

In-Semester Evaluation: 50%

End-Semester Evaluation: 50%