

Approval: 5th Senate Meeting

Course Name : Introduction to High Voltage Engineering and Dielectric Breakdown
Course Number : EE-606
Credit : 3-0-0-3
Prerequisites : EE 303 Power Systems or teachers consent
Students intended for : B.Tech./M.S./Ph.D.
Elective or Compulsory : Elective
Semester : Odd/Even

Preamble: The contents begin with the description of fundamental terminology in the subject of high voltage engineering. It is followed by the classification of electric fields and the techniques of field estimation. Performance of gaseous, liquid and solid dielectrics under different field conditions is described. Generation and measurement techniques for high test voltages will be discussed. Vacuum as insulation and the lightning phenomenon are included.

Course Outline: Electric fields and their numerical estimation; breakdown mechanism, arcs, intrinsic and practical strength of dielectrics; breakdown characteristics of gases, liquids and solids; avalanche, streamer, and leader processes; ageing of solids, liquids and gases; gas insulated systems, effects of corona; generation and measurement techniques of high test voltages. Introduction to national and international standards. Few experiments and modeling and simulation related to course will be carried out.

Modules:

- Electric Field Strength (4 lectures)
- Gaseous Dielectrics (9 lectures)
- Properties of Liquid and Solid Dielectrics (6 lectures)
- Breakdown in Liquid and Solid Dielectrics (4 lectures)
- Generation of High Test Voltages (6 lectures)
- Measurement of High Test Voltages (4 lectures)
- Non-destructive High Voltage Testing and Quality Control (4 lectures)
- Insulation Coordination and Over Voltages in Power Systems (2 lectures)
- Introduction National and International standards such as IEC-60060-1, 60-2, etc. (1 lecture)
- Recent trends and developments (2 lectures)

Textbooks:

1. High Voltage and Electrical Insulation Engineering, By R. Arora, W. Mosch, IEEE Press, August 2011.
2. High Voltage Engineering by M. S. Naidu, Kamaraju, TMH, 2009.

References:

1. High voltage engineering by Kuffel, E., by Newnes 2009.
2. High Voltage Technology by Alston L. L., Oxford University Press (2011)

List of Experiments:

1. To Study the corona phenomena alongside thin copper wire by use of power frequency HV test source.
2. To study electrical breakdown of a sample of in-service HV insulating oil for electrical breakdown against contamination & moisture.
3. To carry out measurements of earthling resistance by three probe method.
4. To carry out measurement of earth resistance by four probe method.
5. To carry out air insulation breakdown studies by using uniform sphere gap spacing.
6. To carry out air insulation breakdown studies by using non-uniuniform sphere gap spacing.
7. To carry out electrical breakdown studies on solid insulations using test setup.