Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
45	30	00	60	100	60	40	4

ELE4209 HIGH VOLTAGE ENGINEERING

Rationale

The course provides students with knowledge on the fundamentals governing generation and control in high voltage power systems.

Course Objectives

By the end of the course students should be able to:

- Understand the generation and measurement of high voltages
- Understand electric fields and field stress control around high voltage systems
- Understand the phenomena involved in non-destructive insulation and testing as well as over voltages in power systems.

Detailed Course Content:

Introduction: [16 Hours]

Generation and transmission of electrical energy, voltage stresses testing voltages ac and dc voltages. Generation of High Voltages: DC and AC voltage generation electrostatic generators, testing transforms, impulse voltages, and their generation, and operation.

Measurement of High Voltages: Peak voltage measurement by sparke gaps, electrostatic voltmeters, ammeters in series with high impedance and high ohmic resistor voltage dividers, generating voltmeter, measurement if peak voltages, impulse voltage measurement.

Electrostatic Fields & Field Stress Control: [16 Hours]

Electric field distribution and breakdown strength of insulating materials; fields in homogeneous isotropic materials, fields in multi dielectric isotropic materials experimental field analysis techniques.

Electric Breakdown in Gases liquids & solids: Review of classic gas laws, ionization and decay processes, cathode processes, secondary effects, sparking voltages, breakdown field strength, corona discharge, surge breakdown, breakdown in solid and liquid dielectrics.

Non-destructive Insulation and Testing: [13 Hours]

HV dielectric loss and capacitance measurement, Partial discharge measurement, calibration of partial discharge dielectric.Phenomenon of over voltages in power systems, and wave propagation over lines and equipment Protection of lines equipment against system over voltages

Learning Outcomes

Knowledge and Understanding

Having successfully completed the module, you will be able to demonstrate knowledge and understanding of:

- Breakdown mechanisms of solids, liquids and gases.
- Partial discharges and their measurement techniques.
- Generation of impulse, dc and ac high voltages.
  Range of techniques to measure different types of high voltages. Transient voltages and their propogation characteristics. Insulation life and accelarated tests.

Intellectual Skills
Having successfully completed the module, you will be able to:

- Apply solid, liquid and gas insulation for a arnge of high voltage apparatus.
- Understand the concept of insulation coordination.
- Use the Bewley Lattice Diagram to calculate surge voltage experienced by high voltage apparatus.
- Assess the lifetime of insulation based on accelarated ageing tests.

Practical Skills
Having successfully completed the module, you will be able to:

- Design high voltage generator.
- Select the right technique to measure different types of high voltages.
- Choose the right surge device to eliminate overvoltages of high voltage apparatus.
- Demonstrate general skills in high voltage engineering.

Method of Teaching /Delivery
The course will be taught by using lectures, tutorials and assignments.
Mode of Assessment
Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	Percentage contribution
Course work (Assignments, tests)	40%
Final examination	60%
Total	100%

Recommended and Reference Books

- Weedy B M, "Electric Power Systems", 4th Edition, Wiley 1998
- Glover J D & Sarma M, "Power System Analysis and Design", 3rd Edition, Brooks/Cole 2002
- Diesendorf W, Insulation Co-ordination in High-Voltage Electric Power Systems, Butterworths 1974
- Gallagher T J and Pearmain A J, High Voltage Measurement, Testing and Design, Wiley 1983
- Kuffel E, High Voltage Engineering, 2nd Edition, Newnes 2000

Possible Lecturers:
Dr. M. K. Musaazi Dr. P. DaSilva Dr. A. Sendegeya Mr. G. Bakkabulindi Mr. C Wasswa Sebuwufu Mr. A. Muguwa