ELE1101 CIRCUIT THEORY

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

Brief Course Description

The course introduces concepts, laws and their applications for DC and AC circuits. It presents basic units theory that enables students to understand and analyze circuits.

Course Objectives

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

- Have a good understanding of the basics of circuit theory and acquire engineering analytic techniques and skills.
- Apply circuit theorems to simplify and find solutions to electrical circuits.
- Interpret, develop and design electrical engineering circuits

Detailed Course Content:

DC Circuits: **[10 Hours]**

Thevenin's and Nortons theorems, superposition theorem, concept of input and output resistance of network, single-port networks, two-port networks, KCL, KVL, electric power, electric energy/work, energy sources, sources transformations, power transfer, maximum power transfer, current and voltage divider theorems, Mesh and Node analysis; D.C. power supplies and their industrial use. Circuit Elements: **[9 Hours]**

Review of circuit concepts of resistance, capacitance, and inductance; volt-ampere relationships for the basic circuit elements; time-varying and alternating quantities, period, fundamental frequency, concept of harmonics; mean/average, rms, sinusoidal voltages and currents, phase and phase difference.

A.C. Circuits: **[8 Hours]**

Complex numbers, Representation of time-varying/sinusoidal quantities, Phasors, rectangular and polar representation; concept of reactance impedance conductance admittance susceptance; phasor diagrams of resistive, purely inductive and purely capacitive impedances; impedances comprising combinations of R, L, and C; Simple circuit solution using phasor diagrams; Power in a.c. circuits, power factor and power factor correction complex power, real and apparent power, the power triangle.

A.C. Circuit Analysis of Simple Networks: **[8 Hours]**

Circuit theorems under a.c. conditions; Thevenin, Norton, and superposition t heorems; KVL, KCL, loop/mesh and node analysis, maximum power transfer under a.c. conditions.

Elementary Transient Signals: Simple functions: step, ramp, impulse, transient analysis of circuits with one energy storage element, impulse response, step response, time constant concept of damping, undamped circuits.

Three Phase Circuits: **[6 Hours]**

Concept of three-phase supply, phase diagrams for 3-phase circuits, balanced 3-phase supply, star and delta circuits, analysis of simple balance 3-phase circuits, power in three-phase circuits power measurement in three phase circuits.

Frequency Response Curves: **[4 Hours]**

Resonance, series and parallel resonance, the concept of Q-factor, tunned circuits frequency selective networks mutually-couple circuits.

Learning Outcomes

On completion of this course the students will:

- Appreciate new concepts in AC and DC Circuit analysis and on completion of this course unit a student will be firmly convinced that the theorems and concepts hold practically;
- Become adept at using various methods of circuit analysis, including simplified methods such as series-parallel reductions, voltage and current dividers, and the node method;
- Appreciate the consequences of linearity, in particular the principle of superposition and Thevenin-Norton equivalent circuits.

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

[1] Dorf and Svoboda, *Electrical circuits: Introduction*

[2] D. R. Cunningham and S. A. Stuller, *Basic Circuit Analysis*, Jaico, 2005
[3] W. H. Hayt, J. E. Kemmerly and S. M. Durbin, *Engineering Circuit Analysis*, 6th ed., Tata McGraw- Hill, New Delhi, 2006

Possible Lecturers:
Dr. E.
Lugujjo
Dr.M. K.
Musaazi Mr.
D. Sebbaale