

## **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 theorems; 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, tuned 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%
<b>Total</b>	<b>100%</b>

### 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* 6<sup>th</sup> ed., Tata McGraw Hill, New Delhi, 2006

**Possible Lecturers:**

Dr. E.

Lugujjo

Dr.M. K.

Musaazi Mr.

D. Sebbaale