ELE2102 ELECTRONIC CIRCUITS

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 gives basic knowledge on the design and operation of electronic circuits.

Course Objectives

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

- Understand the principles of operation of electronic components and circuits
- Design electronic circuits

Detailed Course Content:

Thermionic Devices*:* **[6 Hours]**

Review of the vacuum diode; Principles of operation and characteristics of a triode, tetrode, and pentode; Biasing techniques and load lines; small signal parameters and equivalent circuits; Amplifier analysis and design; Cathode ray oscilloscope, Photoelectric tubes; Mercury arc rectifier.

Diodes*:* **[4 Hours]**

Review of Operation and characteristics of pn junction diodes; Breakdown diodes: Zener and avalanche types; LEDs and tunnel diodes; Single and poly phase rectifier circuits; Ripple factor; smoothing; Voltage regulation; Power supply design and use of regulators; Voltage doubling and multiplying; Clipping; Clamping; Slicer circuits.

Transistors: **[10 Hours]**

Bipolar Junction Transistors: Review of BJT Operation, BJT Fabrication. Heterojunction Bipolar Transistors; Unipolar Devices: Metal-Semi conductor Contacts. Surface charge in MOS Capacitor. The Junction Field Effect Transistor. The MESFET, The MOS Diode. The MOSFET. Heterojunction FETs. JFETs and MOSFETs: Static and dynamic characteristics, biasing and load lines; FET amplifier circuits: CS, CD and CG; Small signal parameters, Equivalent circuits, Amplifier analysis and design; FET as a variable resistor; MOSFETs in digital circuits.

Bipolar Transistors: **[6 Hours]**

Static and dynamic characteristics; Biasing and load lines; Small signal parameters and equivalent circuits; r-parameters, g-parameters, h-parameters and hybrid-pi parameters; Analysis and design of BJT amplifiers: CE, CB, and CC; Comparison of FETs and BJTs.

Frequency Response of Amplifiers: **[6 Hours]**

Inter-electrode capacitances and the Miller effect; High frequency hybrid-pi model of a BJT; FET and pentode high frequency equivalent circuits; Analysis of amplifier performance at low frequency, mid-frequency, Estimation of 3 db frequencies; Bandwidth and gain-bandwidth-product.

Feedback Amplifiers*:* **[6 Hours]**

Negative and positive feedback concepts; Effects of negative feedback on gain, distortion, and bandwidth; Derivation and application of feedback signals; Effect of feedback on input and output impedances; Qualitative discussion of amplifier stability; approximate analysis of single and multistage feedback amplifiers.

Operational Amplifiers*:* **[7 Hours]**

Ideal and non-ideal characteristics of an Opamp; Practical IC Opamps and their characteristics; Feedback amplifiers based on Opamps; Mathematical operations of addition/ subtraction; multiplication by a constant, integration, and differentiation; The Opamp as a comparator; Non-linear applications on Opamps

Mode of Delivery

The course will be taught by using lectures, tutorials and assignments.

Assessment

Assignments, tests, laboratories, and final examination. Their relative contributions to the final grade are :

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

Learning Outcomes

Apply techniques for the analysis and simulation of linear electric circuits, and measurements of their properties

2. Understand resistive and energy-storage elements, controlled sources and operational amplifiers, and transformers

3. Analyze the transient and AC steady state behavior of a circuit

4. Determine the power supplied and distributed in three-phase systems, perform power factor correction
5. Determine the frequency response of a circuit using the s-plane representation and analysis, Bode Plots, Laplace transforms and computer-aided methods

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%**

Reference Material
[1] Thomas and Rosa, The Analysis and Design of Linear Circuits (Laplace Early Edition), Wiley (ISBN
0-471-43299-7)
[2] ***Microelectronic Circuits, 4th edition,*** Adel S. Sedra and Kenneth C. Smith, HRW,1998, ISBN 0-19-
511663-1..

Possible Lecturers:
Dr. J. Butime
Mr. D. Nsubuga Mubiru
Mr. P. Bogere