ELE2111 NETWORK 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

Rationale

The course helps the student to understand the principles and methods used to simplify electric networks.

Course Objectives

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

- Know various types and components of networks
- Apply network concepts to build, simplify and analyse electric and electronic systems.

Detailed Course Content:

Network elements, R,L,M,C: **[10 Hours]**

Review of the volt-ampere equations for these passive circuit elements. Behavior of C and L at t=0 and t = ∞, Step and impulse responses, Concept of coupling, and coupling co-efficient.

Matrix Methods in Network Analysis: Network topology, planar and hinged graphs, KVL and KCL, Mesh and loop formulations, Cut-sets, coupled Circuits

Two Port Networks: **[8 Hours]**

Types of two-port networks, *y*-, *z*-, *h*- and *ABCD* parameters, image impedance, insertion loss, attenuation and phase constants.

Network Functions: **[9 Hours]**

Review of Laplace transforms. Simple first and second order circuits, natural responses, natural frequencies. Poles and Zero Frequency response, Bode plots. General s-plane topics. Mathematical models and block diagrams; transient response characteristics: Second-order systems: steady-state characteristics: classification of system, error criteria: analysis by root-locus: Bode and Nyquist plots, constant M-contours, constant-contours: Nichols chart

Fourier Transforms & the Fourier Integral: Convolution integral. Solution of circuits with periodic but non sinusoidal inputs

Network Stability: **[8 Hours]**

Reliability, stable and unstable network function, realising network functions/ polynomials, positive real network functions. Synthesis of LC, RC, RL and RLC networks, Generalised ladder network

Stability and design procedures: Stability criteria; type of stability; characteristics frequency response testing; system identification; statistical considerations, time-domain identification, frequency domain identification; design; correlation between root-locus and frequency response.

Electric Filters: **[10 Hours]**

Classification of filters, passive and active filter, Filter transfer functions Butterworth and Chebyshev filter, attenuation function, phase function, propagation constant, Normalized filters. Magnitude and frequency normalization. Frequency time functions. Denormalized filter

Computer Aided Network Analysis & Design

Mode of Delivery

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

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%**

Learning Outcomes
The course participant is able to appreciate network and signal theory and their applications to circuit design, filter design and communication theory.

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] Alan V. Oppenheim, Alan S. Willsky, S. Nawab Nawab, Syed Hamid Nawab, *Signals and Systems* (2nd Edition), Prentice-Hall, 1997
[2] S.S. Solimon and M.D. Srinath, *Continuous and Discrete Signals and Systems*(2nd Edition), Prentice Hall, 1998.
[3] S. Haykin and B. Van Veen, *Signals and Systems*, John Wiely & Sons, 1999
[4] L. Balmer, *Signals and Systems: An Introductio*n (2nd Edition), Prentice Hall Europe, 1997

[5] B. P. Lathi, *Linear Systems and Signa*ls, Berkeley Cambridge, 1992.

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