Circuit Theory 1– EEE 303

Department of Electrical & Electronics Engineering
Faculty of Engineering

1. Basic Details

Programme: B.ENG
Year: 2014/2015
Total Units: 2
Level: 300
Taught Semester: First Semester

Instructor:
Engr. K. Adebusuyi
Office: Engineering Building, Ikole Campus
Phone: +234-8134784585
Email: kehinde.adebusuyi@fuoye.edu.ng

Office Hours:
Mondays and Wednesdays (3pm to 5pm) or by appointment

Reading Materials:

Departments:
- Electrical/Electronic Engineering
- Mechatronic Engineering
- Computer Engineering

Prerequisites: **EEE 201, ENG 201**
Prior Knowledge:
- An understanding of the mathematics of Calculus
- Basic understanding Laplace and Fourier transforms
- Understanding of Calculus -Elementary differentiation and Relevant theorems.
- Understanding of Differential equations -Exact Equations
- Understanding of Network Theory fundamentals
- Understanding of the Kirchoff's laws and Nodal Analysis
- Understanding of Basic circuit theorems: Thevenin's, Superposition theorems etc

Lecture Time: **10am – 12noon on Tuesdays**
Total Learning Hours: **20 hours**
Course Delivery: **Face to Face**

Lecturers:
Engr. T. Adefarati
Office: Engineering Building, Ikole Campus
Phone: +234-08064249953

Email: kehinde.adebusuyi@fuoye.edu.ng

2. Course Overview

This course, Circuit Theory 1 (EEE303) takes a detailed look at the application of Laplace transformation to transient analysis of RLC circuits. It provides the students with the basic operational principles behind the non-linear resistive circuits and their suitability for industrial applications. Topics covered include: Laplace and Fourier transforms, Foster and Causer's methods of Synthesis, 2-port network synthesis of non-linear resistive circuits, independent loop equations and independent node equations (loop and nodal analysis), Network graph theory and maximum power transfer theorem.

3. Course Objectives

The objectives of this course include the following:

- To understand Laplace and Fourier transforms, application of Laplace transformation to transient analysis of RLC circuits, transfer function concepts, reliability of functions, Foster and Causer's methods of Synthesis
- To understand the application of Laplace transformation to transient analysis of RLC circuits.
- To establish the ideal characteristics of a non-linear resistive circuits
- To understand the principle behind the 2-port network synthesis
- To enable students to learn how to analyze simple but important applications of circuits
- To understand the differences in operation and applications between linear and non-linear circuits
- To have a detailed understanding and be able to analyze linear circuits using MATLAB,

4. Intended Learning Outcomes (ILO)

Upon successful completion of this course, students should be able to:

- Know Laplace and Fourier transforms
- Analyze linear circuits
- Distinguish between linear and non-linear circuits
- Differentiate between the Foster and Causer's methods of Synthesis and their applications
- Derive expressions for Network graph theory,
- Analyze linear circuits using MATLAB
- Know the applications of computers in the analysis of linear and non-linear circuits

5. Course Content

- Laplace and Fourier transforms
  - **Transfer Function Concepts :** application of Laplace transformation to transient analysis of RLC circuits, reliability of functions,
  - **2-Port Network Synthesis:** Foster and Causer's methods of Synthesis, 2-port network synthesis of non-linear resistive circuits,
- Non-Linear Dynamic Circuits:
  - Harmonic analysis of non-linear dynamic circuits, applications of computers in the analysis of linear and non-linear circuits.
  - Analysis of linear circuits using MATLAB,
- Network graph theory:

- Independent loop equations and independent node equations (loop and nodal analysis), Network reduction by Tee-Pi transformations, maximum power transfer theorem, Millman's and Reciprocity theorems.

6. Course Schedule

Week	Topics	Reading Assignment
1.	Introduction to-Laplace and Fourier transforms	
2.	Application of Laplace transformation to transient analysis of RLC circuits	
3.	Transfer function concepts, reliability of functions,	
4.	Foster and Causer's methods of Synthesis	
5.	2-port network synthesis of non-linear resistive circuits	
6.	Independent loop equations and independent node equations (loop and nodal analysis	
7.	**Quiz Test 1**	
8.	Harmonic analysis of non-linear dynamic circuits	
9.	Applications of computers in the analysis of linear and non-linear circuits	
10.	Network graph theory, Analysis of linear circuits using MATLAB,	
11.	Network reduction by Tee-Pi transformations, Maximum power transfer theorem, Millman's and Reciprocity theorems	
12.	**Quiz Test 2**	
13.	**Revision**	

7. Course Learning & Teaching Methods

The methods to be adopted include:

- Lecture Presentation with mastery quiz at the end of every lecture
- Discussion groups conducted by students
- Tutorials: Students assigned to other students for assistance, peer teaching
- Textbook assignments
- Forum discussion on social media (Circuit Theory Class)

8. Learning & Teaching Activities

Activity Type	Percentage	Hours
Lectures & Class Exercises	25%	20 hrs
Group Tutorials/Discussions	10%	8hrs
Guided independent study	65%	52hrs
Total	**100%**	**80hrs**

9. Course Assessment Method

Requirement:	2 hour examination
Status:	Compulsory
Written Examination:	60%
Quiz/Test:	20%
Homework:	10%
Attendance:	10%

Level of Performance	Grade	Rating (credit points per unit)
70-100%	A = Excellent	5.0

60-69%	B = Very Good	4.0
50-59%	C = Good	3.0
45-49%	D = Fair	2.0
40-44%	E = Poor	1.0
0-39%	F = Failure	0.0

10. Industry Relevance

Network Analysis is major skill that keeps the Engineering industry moving. Knowledge of the network synthesis and its underlying applications makes decision making process faster while designing electronic components and instruments. Such knowledge is required in determining what configuration to use in achieving a particular design goal.

11. Required Text

Electronic Devices and Circuit Theory (7th or later edition) by R. Boylestad and L. Nashelsky, Prentice Hall

12. Recommended Texts

1. *Electronic Devices and Circuits* by J. B Gupta; S. K. Kataria and Sons, 2013
2. *Fundamentals of Electrical Engineering and Electronics (9th edition)* by J. B Gupta; S. K. Kataria and Sons, 2012 reprint
3. *Electronics Fundamentals: Circuits, Devices and Applications (8th Edition)* by Thomas L. Floyd; Prentice Hall, 2009
4. *Electronics Basic, Analogue and Digital with SPICE* by Nashir H. Sabah; CRS Press
5. *Problems and Solutions of Electronic devices and circuits* by Experienced Teachers; CBS Publishers and Distributors Pvt Ltd, India, Reprint 2009
6. *Electronic Devices and Circuits (6th edition)* by T. F. Bogart Jr, J. S. Beasley & Guillermo Rico; Pearson education, 2004
7. *A Textbook of Electrical Technology* by B.L Theraja & A. K Theraja; S. Chand Publishing, 2009

13. Attendance Policy

Attendance is strictly mandatory. The University policy stipulates that in order to be eligible for a course examination, a student shall be expected to attend a minimum of 65% of the lecture, tutorials, practical and classes for the course in which he/she is registered **[Ref. Students' Handbook of Information, pg. 52].** Any student, therefore, whose attendance rating falls below the required 65% shall not be eligible to write the course exam. In this regard, students will be notified of their eligibility status for a course examination prior to the exam.

14. Calculator Policy

Programmable calculators will not be allowed in the quizzes or final exam. The University policy prohibits the use of mobile phone, electronic programmable calculator, information storage devices, etc. in the quizzes or final exam **[Ref. Students' Handbook of Information, Pg. 49].** A "programmable calculator" is one that can store program steps or text at any level of sophistication and the rule applies irrespective of whether or not there appears to be anything stored. If you are in any doubt as to the eligibility of your calculator, please see me well before the quiz/exam.

15. Exemption from Quizzes/Exam

Dated medical documentation is required for exemption from a quiz; in this case the weighting will be moved to the final. Makeup quizzes will not be offered under any circumstances. The University policy prohibits a student from absenting from exam except on acceptable medical grounds, and in

consultation with the HOD and the Dean of the Faculty. Any student absent on the ground of illness must produce a certified medical report, and students who absent from quizzes/exams for reasons other than illness, accident or some exceptional circumstances shall be deemed to have failed the course **[Ref. Students' Handbook of Information, Pg. 52].**

16. Ethical and Unethical Conduct

The preliminary purpose of Homework is to help students learn and gain practical experience in the subject matter. Allowing and encouraging collaborations with fellow students best serves this purpose. Modern engineering is, after all, almost exclusively a team effort. However, fairness requires us to be able to assess ***your own*** contribution. Therefore, the written material that you hand in ***must*** be ***your own work***, and any discussions or collaborations with fellow students must be identified in writing on your solution (e.g. noting "the solution to problem #5 was worked out together with Mark Davison", or "the solution to problem #2 was benefited from discussions with Ruth Peters"). Nearly identical solutions from different students who do not cross-reference each other will be viewed as statistically "unlikely", thus worthy of further examination.
This policy is intended to help you make the most out of the course by allowing you to freely work with your classmates. If you are in any doubt as to what constitutes ethical or unethical conduct, please see any member of staff for assistance. Violations of this policy will be handled with maximum severity.