Analogue Electronic Circuit – EEE323

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:
Hilary Ugo Ezea, M.Eng
Office: Engineering Building, Ikole Campus
Phone: +2348030889118
Email: hilary.ezea@fuoye.edu.ng

Office Hours:
Mondays and Fridays: 3.30pm to 5pm or by appointment

Reading Materials:
http://eee.fuoye.edu.ng/300l-s-semester/f-semester/175-eee-323-analogue-electronic-circuit-3-units.html

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

Prerequisites: **EEE202**
Prior Knowledge:
- An understanding of the physics of semiconductors materials
- Basic understanding of pn junctions
- Understanding of Transistors fundamentals
- Understanding of the Kirchoff's laws
- Understanding of Basic circuit theorems: Thevenin's, Superposition theorems etc

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

Lecturers:
Engr. K. Adebusuyi
Office: Engineering Building, Ikole Campus
Phone: +2348134784585
Email: kehinde.adebusuyi@fuoye.edu.ng

2. Course Overview

This course, Analogue Electronic Circuit (EEE323) takes a detailed look at the amplification properties of a transistor. It provides the students with the basic operational principles behind the use of Transistors as amplifiers, gives the different amplifier configurations and pinpoints their suitability for industrial applications. Topics covered include: Review of Single-Stage Transistor amplifiers, Multi-Stage amplifiers, Op-Amps, Power amplifiers, Voltage and Current Stabilizing Circuits.

3. Course Objectives

The objectives of this course include the following:

- To understand the classifications of amplifiers based on configuration, biasing conditions, amplifier input/output signals, and frequency response
- To understand the idea of amplifier cascading
- To establish the ideal characteristics of an Ideal Op-amp
- To understand the principle behind the operations of the different Op-amps
- To enable students to learn how to analyze simple but important applications of these devices in electronic circuits
- To understand the differences in operation and applications between Inverting and Non-inverting amplifiers
- To have a detailed understanding, and be able to analyze and design simple circuits for linear amplification of signals and for Voltage control.

4. Intended Learning Outcomes (ILO)

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

- Tell the operational differences between the Common-Emitter amplifier, Common-Base amplifier, and Common-Collector amplifier as well as identify the similarities between the operations of the following pairs of amplifiers: Common-Emitter & Common Source amplifiers, Common-Collector and Common-Drain amplifiers.
- Analyze simple multistage amplifiers
- Distinguish between Ideal Op-amp and Practical Op-amp
- Differentiate between the negative and positive feedbacks and their applications
- Derive expressions for the output power of the different power amplifier classes
- Explain how power amplifiers are used in regulated power supplies, motor controllers, etc.
- Determine which power amplifiers are intended to deliver power over a wide range of frequency and which ones are most suitable for power delivery at one particular frequency only.
- Explain the limitations of the various amplification devices, identify the appropriate device for a given problem or situation, and justify the selection
- Design simple devices and circuits to meet stated operating specifications

5. Course Content

- Single-Stage Transistor amplifiers
    - **Bipolar Junction Transistor (BJT) amplifiers:** Graphical Analysis and AC Equivalents Circuits, Small Signal hybrid-pi model, early effect, Common-Emitter Amplifiers, Common-Collector Amplifiers, Common-Base Amplifiers
    - **JFET amplifiers:** Small-Signal Equivalent Circuit, Small-Signal Analysis, Common-Source, Common-drain, Common- Gate amplifiers

- **MOSFET Amplifiers:** Graphical Analysis, load line and Small-Signal parameters, AC Equivalent Circuit, Small-Signal Model, Common-Source, Common-drain, Common- Gate amplifiers
- Low and high frequency response of single stage amplifiers

➢ Multi-Stage amplifiers:
- Multistage amplifier circuits: (CS-CS), (CS-CE) cascade, (CS-CG) Amplifiers & Darlington pair.
- Low and high frequency response of multistage amplifiers

➢ Op-Amps
- Ideal Op-amp
- Basic Op-amp circuit
- Open-Loop Op-amp: Differential Op-amp, Inverting and Non-Inverting Op-amps
- Closed-Loop Op-amp: Negative feedback Op-amp, Positive feedback Op-amp
- Op-amp applications: Linear amplifier, Unity follower, Adders, Subtractors, Differentiators, Integrators, Comparators

➢ Power amplifiers
- Class A
- Class B
- Class AB
- Class C
- Class D

➢ Voltage and Current Stabilizing Circuits.

6. Course Schedule

Week	Topics	Reading Assignment
1.	Bipolar Junction Transistor (BJT) Amplifiers	
2.	Field Effect Transistors	
3.	Multistage amplifiers	
4.	Ideal Op-amp & Basic Op-amp circuit	
5.	Open-Loop Op-amp and Closed-Loop Op-amp	
6.	Op-amp applications	
7.	**Quiz Test 1**	
8.	Class A amplifier and Class B amplifier and their applications	
9.	Class AB amplifiers, Class C and Class D amplifiers and their applications	
10.	Voltage and Current Stabilizing Circuits	
11.	Design of Voltage Stabilizing Circuits	
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 (Electronic Circuit 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

Transistor amplifiers have become the mainstay of the electronics industry. Knowledge of the underlying operational principles of the different classes and configuration of amplifiers goes a long way in the process of decision making while designing electronic components and instruments. This is because 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.