EE3110: ANALOGUE ELECTRONIC CIRCUITS

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Analogue Electronic Circuits

Subject Code
EE - Electrical Engineering
Course Number
3110

Academic Unit
Electrical Engineering (EE)

College/School
College of Engineering (EG)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
EE2301 Basic Electronic Circuits
or
EE2005 Electronic Devices and Circuits

Precursors
EE2109 Electronic Circuits

Equivalent Courses
EE3122 Analogue Circuit Fundamentals

Exclusive Courses
Nil

Part II Course Details

Abstract

The aims of the course are to present the techniques used in the analysis of analogue circuits and to apply them to a spectrum of different uses.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify, differentiate and analyze the frequency effects of amplifiers			x	
2	Identify, differentiate and construct the equivalent model/circuit of feedback amplifiers			x	
3	Analyze using circuit/feedback theory the performance of feedback amplifiers			x	
4	Assess and apply feedback/circuit analysis to amplifiers and oscillators		x	x	
5	Evaluate and apply feedback to amplifiers and oscillators		x	x	
6	Identify different techniques used in monolithic circuits			x	

A1: Attitude
Develop an attitude of discovery/innovation/creativity, as demonstrated by students possessing a strong sense of curiosity, asking questions actively, challenging assumptions or engaging in inquiry together with teachers.

A2: Ability
Develop the ability/skill needed to discover/innovate/create, as demonstrated by students possessing critical thinking skills to assess ideas, acquiring research skills, synthesizing knowledge across disciplines or applying academic knowledge to real-life problems.

A3: Accomplishments
Demonstrate accomplishment of discovery/innovation/creativity through producing /constructing creative works/new artefacts, effective solutions to real-life problems or new processes.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Lectures are given on the basic principles followed by examples to demonstrate it application.	1, 2, 3, 4, 5, 6	2 hrs/wk
2	Tutorial	Problems are carried out by asking students how to do each step.	1, 2, 3, 4, 5, 6	1 hr/wk

3	Laboratory/Mini-project	Enables students to put into practice what they learnt in class. Students will have a structured laboratory session followed by a practical design problem.	1, 2, 3, 5	3 hrs/wk (3 weeks lab)
4	Laboratory self-practice	Students who have not been able to follow the assigned schedule will be given time to complete each session to allow them to continue with the next part.	1, 2, 3, 5	3 hrs/wk (3 weeks lab)

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tests (min.: 2)	1, 2, 3, 4, 5	40	
2	#Assignments (min.: 3)	1, 2, 3, 4, 5, 6	5	
3	Lab Exercises/Reports	1, 2, 3, 5	15	

Continuous Assessment (%)

60

Examination (%)

40

Examination Duration (Hours)

2

Additional Information for ATs

Remark:
To pass the course, students are required to achieve at least 30% in course work and 30% in the examination. Also, 75% laboratory attendance rate must be obtained.

may include homework, tutorial exercise, project/mini-project, presentation

Assessment Rubrics (AR)

Assessment Task

Examination

Criterion

Achievements in CILOs

Excellent (A+, A, A-)

High

Good (B+, B, B-)

Significant

Fair (C+, C, C-)

Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Assessment Task
Coursework

Criterion
Achievements in CILOs

Excellent (A+, A, A-)
High

Good (B+, B, B-)
Significant

Fair (C+, C, C-)
Moderate

Marginal (D)
Basic

Failure (F)
Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

Revision on Transistor Circuits Modeling
Modeling of BJTs and FETs, construction and analysis of small signal ac equivalent circuits; switching characteristic; different types of BJT and FET

Frequency Response of Amplifiers
Low frequency response: coupling and bypass capacitors. Mid-frequency response. High frequency response.

Feedback Amplifiers
Ideal feedback amplifiers: gain stability, signal-noise ratio, effects on gain and bandwidth, types of feedback amplifiers, effects on input and output impedance. Practical feedback amplifiers: voltage amplifier, transadmittance amplifier, transimpedance amplifier, current amplifier, prediction of stability, frequency response.

Oscillators
Oscillation conditions: Barkhausen criterion, loop gain, phase shift, Oscillator circuits: Wein bridge, phase shift, Colpitts, Pierce, Hartley, piezoelectric crystal oscillators.

Monolithic Circuit Techniques
Current sources: simple current source, Widlar and Wilson current source, matching considerations in transistor current sources. Active loads: current sources as active loads, common-emitter and differential amplifiers with active loads. Output stages: biasing, Darlington, push-pull, current limiter.

Laboratory/Mini-project Experiment:
Students will form groups with size 3-5 to achieve a mini-project with progressing complexity. They need to apply problem solving skill with the concepts learnt to fulfill the given goal through team works.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	Muhammad H. Rashid: Microelectronic Circuits: Analysis and Design, (PWS Publishing Company, 1999)
2	Jacob Millman, Christos C. Halkias and Satyabrata Jit: Millman’ s Electronic Devices and Circuits, (Tata McGraw Hill, second edition 2007)
3	Donald A. Neaman: Microelectronics: Circuit Analysis and Design, (McGraw-Hill, third edition 2007)