BME2029: ELECTRICAL AND ELECTRONIC PRINCIPLES

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Electrical and Electronic Principles

Subject Code
BME - Biomedical Engineering
Course Number
2029

Academic Unit
Biomedical Engineering (BME)

College/School
College of Biomedicine (BD)

Course Duration
One Semester

Credit Units
3

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

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil#

Equivalent Courses
Nil

Exclusive Courses
Nil

Additional Information
It is desirable that students have done some courses in A-level Mathematics with knowledge of differential equations, algebra, complex numbers, etc.

Part II Course Details

Abstract

This course covers the fundamental concepts, general background and practical knowledge of electrical and electronic engineering at a level appropriate for biomedical engineering, mechanical engineering and manufacturing engineering students. The course aims to present the principles of electrical and electronic engineering with practical applications. Furthermore, this course also aims to equip students with analysis skills of various circuits and design skills of some simple circuits, and thus enable students to develop skills in solving practical problems of electrical and electronic engineering.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe basic circuit laws, such as Ohm's law, Kirchhoff's current law, Kirchoff’ s voltage law and working principles of basic building blocks of electronic devices (diode, transistor, amplifier).		x	x	
2	Explain and solve transient/steady-state responses.			x	
3	Apply various analytical methods to solve DC circuit problems.			x	
4	Solve electronic circuit problems such as rectifier circuits, wave-shaping circuits, filter circuits and amplifier circuits.			x	x
5	Design simple filters and amplifiers.				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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lecture	Students will develop the understanding of key concepts and basic knowledge.	1, 2, 3, 4, 5	3 hrs/week
2	Laboratory Work	Students will apply the learned knowledge to conduct hands-on experiment.	2, 3, 5	3 hrs/week for 2 weeks

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Midterm Test/Quiz	1, 2, 3, 4	30	
2	Laboratory Reports	2, 3, 5	10	2 reports to be submitted

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

2

Additional Information for ATs

For a student to pass the course, at least 30% of the maximum mark for both coursework and examination should be obtained.

Assessment Rubrics (AR)

Assessment Task

Midterm Test/Quiz

Criterion

Ability to grasp fundamental knowledge related with the electric circuit.

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

Laboratory Reports

Criterion

Ability to design experiment, conduct proper measurement by applying the learned knowledge to specific problems, and perform data analysis.

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
Examination

Criterion
Ability to understand basic concepts related with the DC and AC circuit as well as electronics.

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
Electric laws and resistive circuits; Circuit analysis; Inductance and capacitance; Transients analysis; Steady-state sinusoidal analysis and phasors; Filters, frequency response, and resonance; Diodes and applications; Bipolar junction transistors (Working principle, Large signal analysis, Emitter Follower); Specifications and external characteristics of amplifiers; Operational amplifiers and applications (Working principles, Gain calculation); Transformers

Reading List

Compulsory Readings

	Title
1	A.R. Hambley, Electrical Engineering, Principles and Applications, Prentice Hall, 7th Edition, 2019. ISBN13: 978-1292223124.

Additional Readings

	Title
1	G. Rizzoni and J. Kearns, Principles and Applications of Electrical Engineering, McGraw Hill, 6th Edition, 2016.
2	R. C. Dorf and J. A. Svoboda, Electric Circuits, John Wiley & Sons, Inc., 9th Edition, 2014.

3	Other relevant books or literatures may be chosen by students for self-teaching, writing the lab reports and assignments.