City University of Hong Kong
Course Syllabus

offered by Department of Electrical Engineering
with effect from Semester B, 2020/2021

Part I Course Overview

Course Title:	Differential Equations for Electrical Engineering
Course Code:	EE3121
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	3
Proposed Area: *(for GE courses only)*	☐ Arts and Humanities ☐ Study of Societies, Social and Business Organisations ☐ Science and Technology
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	MA2001 Multi-variable Calculus and Linear Algebra
Precursors: *(Course Code and Title)*	Nil
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course introduces differential equations for solving practical problems of electrical and electronic engineering, including power conversion, wireless communication and circuit analysis. It is to help students develop the ability to carry out engineering analyses for engineering problems involving differential questions. This is a project-based course that provides our students with simulation tools to enhance the learning of this course.

2. Course Intended Learning Outcomes (CILOs)

(CILOs state what the student is expected to be able to do at the end of the course according to a given standard of performance.)

No.	CILOs[#]	Weighting* (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	*A2*	*A3*
1.	Evaluate geometric problems with vector arithmetic and vector calculus in rectangular coordinate, cylindrical coordinate, and spherical coordinate systems		√	√	
2.	Explain at high-level concepts from differential equations, transforms, line and surface integrals.			√	
3.	Apply first- and second-order ordinary differential equations, systems of linear differential equations, linear partial differential equations: diffusion, Laplace equation and wave equation in wireless communication systems		√	√	
4.	Apply a simulation tool to analyse the performance of a circuit system.		√	√	
5.	Apply a simulation tool to analyse the performance of a wireless system.		√	√	
		100%			

** If weighting is assigned to CILOs, they should add up to 100%.*

[#] Please specify the alignment of CILOs to the Gateway Education Programme Intended Learning outcomes (PILOs) in Section A of Annex.

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 self-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.

3. Teaching and Learning Activities (TLAs)

(TLAs designed to facilitate students' achievement of the CILOs.)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4	5		
Lecture	Key concepts are described and illustrated.	√	√	√	√	√		3 hrs/wk

Tutorial	Key concepts are worked out based on examples or problems.	√	√	√	√	√		1 hr/wk
Project	Key concepts are worked out by simulations and/or experiments.				√	√		

4. Assessment Tasks/Activities (ATs)

(ATs are designed to assess how well the students achieve the CILOs.)

Assessment Tasks/Activities	CILO No.						Weighting*	Remarks
	1	2	3	4	5			
Continuous Assessment: 50%								
Tests (min.: 2)	√	√	√				30 %	
#Assignments (min.: 3)	√	√	√	√	√		15 %	
Simulations				√	√		5 %	
Examination: 50% (duration: 2hrs, if applicable)								
Examination	√	√	√	√	√		50 %	
** The weightings should add up to 100%.*							100%	

Remark:

To pass the course, students are required to achieve at least 30% in coursework and 30% in the examination.

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

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Examination	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Coursework	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal levels

6. Constructive Alignment with Major Outcomes

MILO	How the course contribute to the specific MILO(s)
1	The mathematics areas that are fundamental in electrical engineering are introduced and their applications are explained.
5	Application examples are used to illustrate how engineering problems can be formulated using the differential equations and how to obtain the solutions.

Part III Other Information (more details can be provided separately in the teaching plan)

1. Keyword Syllabus

(An indication of the key topics of the course.)

Vector Calculus for Engineering

Vector calculus in rectangular coordinate, cylindrical coordinate, and spherical coordinate systems; Curl and divergence; Line and surface integrals; Theorems of Gauss, Stokes, and Green.

Ordinary Differential Equations in Electrical and Electronic Engineering

First order differential equations, Second and higher order linear differential equations; Laplace transform; System of linear differential equations for the circuit design, electromagnetics, and wireless communication.

Partial differential equations in Electronic and Electronic Engineering

Diffusion, wave and Laplace equations; Initial value problems; Fourier series; Boundary value problem. Simulation projects for solving engineering problems in the circuit design and wireless communication.

2. Reading List

2.1 Compulsory Readings

(Compulsory readings can include books, book chapters, or journal/magazine articles. There are also collections of e-books, e-journals available from the CityU Library.)

1.	Vector Calculus by Peter Baxadall & Hans Liebeck, Dover Publications, 2008
2.	Mathematics for Engineering and Science, Department of Mathematics, City University of Hong Kong, Prentice Hall, Pearson Education South Asia, 2008
3.	Differential Equations (4^{th} ed.) by Richard Bronson, Mc-Graw Hill, 2016

2.2 Additional Readings

(Additional references for students to learn to expand their knowledge about the subject.)

1.	Nil.