City University of Hong Kong
Course Syllabus

offered by Department of Electrical Engineering
with effect from Semester A in 2020/2021

Part I Course Overview

Course Title:	Introduction to Electromagnetics
Course Code:	EE2104
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	B2
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)*	(MA1201 Calculus and Basic Linear Algebra II or MA1301 Enhanced Calculus and Linear Algebra II) and (EE1002 Principles of Electrical Engineering/Principles of Electronic Engineering or PHY1201 General Physics I or PHY1202 General Physics II or MBE2029 Electrical and Electronic Principles II)
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

This course aims to provide students with an understanding of the principles of electromagnetics with emphasis on some basic problem-solving skills in electric and magnetic laws and theory.

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.	Identify and calculate the physical quantities of the static electric field.		√	√	
2.	Identify and calculate the physical quantities of the static magnetic field.		√	√	
3.	Apply the Maxwell's equations to quasi-static electromagnetic problems.		√	√	
4.	Apply elementary methods to solve the Laplace's and Poisson's equations.		√	√	
		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			
Lectures.	Lectures on the course materials with theories and examples.	√	√	√	√			3
Tutorials	Tutorials for consolidating the lectures and working out some problem sets.	√	√	√	√			1

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				
Continuous Assessment: 50 %								
Tests (min.: 2)	✓	✓	✓	✓			30 %	
#Assignments (min.: 3)	✓	✓	✓	✓			20 %	
Examination: 50 % (duration: 2 hrs , 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 course work 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	Below marginal
2.Continuous Assessment	Achievements in CILOs	High	Significant	Moderate	Basic	Below marginal

6. Constructive Alignment with Major Outcomes

MILO	How the course contribute to the specific MILO(s)
1	An ability to apply knowledge of mathermatics, science and engineering.
5	An ability to identify, evaluate, formulate and solve engineering problems.

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

1. Keyword Syllabus

Vector Analysis
Sum and product of vectors. Vector calculus. Cartesian, cylindrical and spherical coordinates. Differential length, differential surface area and differential volume.

Static Electric Field
Coulomb's law. Gauss's law. Applications of Coulomb's law and Gauss's law - Electric field evaluation due to the charges in the form of a spherical shell, an infinite line, a finite line, an infinite cylinder and a spherical cloud. Capacitance calculation of a coaxial cable. Divergence theorem. Stokes's theorem.

Static Magnetic Field
Ampere's law. Gauss's law. Biot-Savart law. Applications of Ampere's law and Biot-Savart law - Magnetic field evaluation due to the current in an infinite line, a circular loop, a solid conductor and a toroidal coil.

Quasi-Static Electromagnetic Field
Faraday's law of electromagnetic induction. Lorentz force on charged particles in electric and magnetic fields. Ohm's law. Joule's law. Conduction and displacement currents. Complex conductivity and permittivity. Power stored in a complex material.

Solution of Field Equations
Analytical and numerical methods. Applications of analytical and numerical methods to 2D electric field problems.

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.)*

	Fawwaz T. Ulaby: Fundamentals of Applied Electromagnetics, 5th Edition, (Pearson Prentice Hall) ISBN 0-13-229630-6

2.2 Additional Readings

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

	W. H. Hayt and J. A. Buck: Engineering Electromagnetics, 7th Edition, (McGraw Hill) ISBN 007-124449-2