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 Electric Machines and Drives
Course Code:	EE3124
Course Duration:	13 weeks
Credit Units:	3
Level:	B3
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)*	EE3123 Introduction to Electric Power Systems
Precursors: *(Course Code and Title)*	EE2005 Electronic Devices and Circuits
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

To introduce (i) the operating principles of electric machines and drives, including AC and DC machines; and (ii) the applications of various types of drives in automation systems, electric vehicles, and robotics.

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.	Describe the fundamental parts of electrical drives including converter, electrical machine and load.		√	√	
2.	Describe the operating principles of induction machines, synchronous machines and dc machines.		√	√	
3.	Apply appropriate methods for machine design and analysis, including phasor methods and equivalent circuit models.		√	√	
4.	Explain the various practical issues in machine operation, including losses, harmonics, and efficiency.		√	√	
	** If weighting is assigned to CILOs, they should add up to 100%.*	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	
Lecture	Delivery of course materials, including analysis, models and operating principles of machines	√	√	√	√	2 hrs/week
Tutorial	Strengthening concepts and working out problems	√	√	√	√	1 hr/week
Mini-project	Projects on comparing the use of different types machines in	√	√	√	√	3 hrs/week for 6 weeks

	electric vehicles and other applications					

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%								
#Assignments (min.: 3)	√	√	√	√			5%	
Tests (min.: 2)	√	√	√	√			30%	
Lab/ Mini-project	√	√	√	√			15%	
Examination: 50% (Duration: 2 hrs, if applicable)								
	√	√	√	√			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. Also, 75% laboratory attendance rate must be obtained.

may include homework, tutorial exercise, 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-)	Adequate (C+, C, C-)	Marginal (D)	Failure (F)
1. Continuous Assessment	Achievement in CILOs	High	Significant	Moderate	Basic	Below Marginal
2. Examination	Achievement in CILOs	High	Significant	Moderate	Basic	Below Marginal

6. Constructive Alignment with Major Outcomes

MILO	How the course contributes to the specific MILO(s)
1, 2, 5	Through the study of the basic theory and operating principles of electric machines, students are expected to develop an ability to apply basic knowledge of mathematics, science and engineering principles for identifying the problems, formulating solutions, and implementing the solutions to solve engineering problems.
7, 10	The mini-project involves active sharing of ideas and applying engineering principles and tools to solve hands-on problems. Report write-ups, discussions, and demonstrations will directly contribute to the development of effective communication skills.

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

1. Keyword Syllabus

Basic components in electrical drives: converter, electric machine and load. Basic principles of energy conversion in electromechanical systems.

AC machines: Windings and construction, poly-phase machine; induction machine, key parameters, model, characteristics, torque control; permanent-magnet (PM) synchronous machine, model, analysis by phasor diagrams, control; design for power generation, synchronisation.

DC machines: field and armature interaction, series and shunt motors, brushless motor, separately excited machine, brushless construction, models, speed drive control.

Applications and trends: variable speed drives in automation systems and robotics, induction and PM machines in electric vehicles, regenerative braking, use of computer control and power electronics.

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.	S. Filizadeh, *Electric Machines and Drives*, 1st Edition, CRC Press, 2017.

2.2 Additional Readings

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

1.	A. E. Fitzgerald, C. Kingsley, and S.D. Umans, *Electric Machinery*, 6th Edition, McGraw-Hill, New York, 2003.
2.	P. C. Sen, *Principles of Electric Machines and Power Electronics*, Wiley, New York, 1997.