City University of Hong Kong
Course Syllabus

offered by Department of Electronic Engineering
with effect from Semester B in 2017/2018

Part I Course Overview

Course Title:	Modern Power Electronics
Course Code:	EE6427
Course Duration:	One Semester (13 weeks)
Credit Units:	3
Level:	P6
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
Precursors: *(Course Code and Title)*	EE4101 Modern Power Electronics; or equivalent
Equivalent Courses: *(Course Code and Title)*	Nil
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

This course aims to enable students to gain an understanding of the principles and industrial applications of modern power electronics. International regulations concerning all modern electronic equipment and the latest technology to meet these regulations will be presented.

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 the practical characteristics of power electronic devices and circuit components.		✓		
2.	Analyse, design and implement switching methods for AC-DC and DC-AC power converters.		✓	✓	✓
3.	Acquire power conversion concepts to power system applications.		✓	✓	✓
4.	Describe international regulations related to electromagnetic compatibility and techniques to meet them.			✓	✓
		100%			

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	Key concept of power electronic converter systems will be discussed	✓			✓			2 hrs/wk
Tutorials	Key concepts are worked out based on questions and problem solving			✓				1hr/wk (*Some of the tutorials will be conducted in the laboratory)*
Laboratory	Lab sessions with hand-on experience, for the power electronic converter systems		✓					

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: 30%								
At least 3 assignments (laboratory etc.)	✓	✓	✓	✓			20%	
Quiz I & II	✓	✓					10%	
Examination: 70% (duration: 2hrs)								
							100%	

Remark:

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

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 level
2. Coursework	Achievements in CILOs	High	Significant	Moderate	Basic	Not even reaching marginal level

6. Constructive Alignment with Programme Outcomes

PILO	How the course contribute to the specific PILO(s)
1, 2	To understand the latest technology and trends in power electronic technology.
1, 2, 3, 4	To analyze power electronic circuits and systems.

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

1. Keyword Syllabus

Power Electronic Devices
Review of power electronic devices - power diode, power BJT, power MOSFET, IGBT. Switching characteristics. Device limitations and protection techniques, snubber circuits. Base/gate drive circuits; isolation techniques

DC-DC Conversion
Series-pass supplies, efficiency, performance, applications. The switch-mode supply principle, comparison with series pass, applications. The off-line supply switch-mode system. Step-up and step-down topologies; buck, boost and flyback, transformer coupled circuit arrangements

AC-DC Conversion
Performance parameters, Power factor correction circuit.

DC-AC Inversion
Principle of operation, performance parameters, modulation techniques, harmonic reductions. Inverter types; three-phase, series resonant
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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.	Nil

2.2 Additional Readings

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

1.	N Mohan, T M Undeland and W P Robins: Power Electronics : Converters, Applications and Design, (2nd Edition, John Wiley & Sons, 1995)