City University of Hong Kong
Course Syllabus

offered by School of Energy and Environment
with effect from Semester B 2018/19

Part I Course Overview

Course Title:	Sustainable and Renewable Energy
Course Code:	SEE3104
Course Duration:	One semester
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)*	SEE3101 Engineering Thermofluids II
Precursors: *(Course Code and Title)*	SEE3102 Power Plant Engineering; SEE3103 Energy Efficiency for Buildings
Equivalent Courses: *(Course Code and Title)*	SEE4104 Sustainable Energy and Development
Exclusive Courses: *(Course Code and Title)*	Nil

Part II Course Details

1. Abstract

(A 150-word description about the course)

This course will introduce a range of renewable technologies, including biomass, wind, wave, tidal and photovoltaic, and evaluate the potential impact of embracing a major shift to the development and utilisation of renewable energy. The students will learn about fundamental concepts of sustainability, technology, and the methods to evaluate their significance. Sustainable and renewable energy in the wider technology, application, and environmental contexts will be discussed.

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 issues relevant to the emergence and ongoing development of sustainable processes in the wider technological, economic, social and environmental contexts	10	√		
2.	Evaluate the renewable energy sources to grid connection and utilization	15	√	√	√
3.	Identify the methodologies and tools available for sustainable and renewable energy application	15	√	√	√
4.	Recognise the context of the drivers, challenges and indicators to measure sustainability and renewable energy	10		√	
5.	Analyse the different sources of renewable energy and innovative technologies in harnessing energy from these renewable sources	50	√	√	√
		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	**Lectures** on (1) The Basics of Energy and Power; (2) Electrical Fundamentals; (3) Solar Energy; (4) Wind Energy; (5) Electric Vehicle; (6) Biomass Energy; (7) Water (Hydro and Ocean) Energy	√	√	√	√	√		2.5 hrs/wk
In-class exercises	**In-class exercises** will be handed out to students to assess students' concepts and grasp of knowledge taught in class	√	√	√	√	√		0.5 hr/wk
Readings	**Reading materials** including reference books, journal papers and related online articles will be provided to students to facilitate self-directed learning.	√	√	√	√	√		
Mid-term exam	**Mid-term exam** will be arranged to assess students' understanding and ability to apply subject-related knowledge learned in class, textbooks and required reading materials.	√	√	√	√	√		
Examination	**Examination** will be arranged to assess students' understanding and ability to apply subject-related knowledge learned in class, textbooks and required reading materials.	√	√	√	√	√		

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: _75___%								
In-class exercises Students need to complete in-class exercises and participate actively in discussing these exercises to facilitate their understanding of knowledge taught in class.	√	√	√	√	√		16%	
Case study and oral presentation Students will work in groups, prepare and deliver oral	√	√	√	√	√		20%	

presentation on '**Design a 100% Renewable Energy System' using** different renewable energy sources to meet the expected need in various cases. Students are required to make assumptions on how the seasonal and daily pattern of generation and use will be. Students will present their design and to describe the pros and cons of the solution and the technical challenges.								
Assignments One assignment on solar energy and wind energy to demonstrate their understanding of the concepts One assignment on biomass energy and water energy to demonstrate their understanding of the concepts	√	√	√	√	√		10%	
Field Trip Report Students will write a summary of a field trip visit to see the latest electric vehicle demonstration. Students will report their learning during the visit and describe importance of EV on the social and economic development in terms of Sustainable Energy and Environment in Hong Kong.	√		√				4%	
Mid-term exam Students will be assessed via the mid-term exam their understanding of concepts learned in class, textbooks, reading materials, and their ability to apply subject-related knowledge.	√	√	√	√	√		25%	duration: 2 hours, if applicable
Examination: _25___% (duration: 2 hours , if applicable)								
Examination Students will be assessed via the examination their understanding of concepts learned in class, textbooks, reading materials, and their ability to apply subject-related knowledge.	√	√	√	√	√		25%	
** The weightings should add up to 100%.*							100%	

Examination duration: 2 hrs
Percentage of coursework, examination, etc.: 75% by coursework; 25% by exam

To pass a course, a student must do ALL of the following:
1) obtain at least 30% of the total marks allocated towards coursework (combination of assignments, pop quizzes, term paper, lab reports and/ or quiz, if applicable);
2) obtain at least 30% of the total marks allocated towards final examination (if applicable); and
3) meet the criteria listed in the section on Assessment Rubrics.

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. In-class exercises	Ability to evaluate and analyse sustainable and renewable energy problems, and to discuss their calculations/findings to others.	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Case study and oral presentation	Ability to design 100% renewable energy system, and to determine the potential for different renewable energy sources and the expected need.	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Assignments	Ability to analyse and calculate practical problems in sustainable and renewable energy	High	Significant	Moderate	Basic	Not even reaching marginal levels
4. Field Trip Report	Ability to report their learning after field trip	High	Significant	Moderate	Basic	Not even reaching marginal levels
5. Mid-term exam	Ability to apply renewable energy knowledge to solve problems related to energy issues.	High	Significant	Moderate	Basic	Not even reaching marginal levels

6. Examination	Ability to apply renewable energy knowledge to solve problems related to energy issues.	High	Significant	Moderate	Basic	Not even reaching marginal levels

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.)

- Economic and social sustainability
- Biomass
- Wind
- Water, wave, tidal
- Solar thermal, Photovoltaic
- Transport; Electric Vehicles
- Renewable energy to grid

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.	D. Buchla, T. Kissell, T. Floyd, *Renewable Energy Systems*, Peason, 2015

2.2 Additional Readings

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

1.	Afgan, N.H., Carvalho, M. da G., *New and Renewable Energy Technologies for Sustainable Development*, Balkema, 2004.
2.	Freris, L.L., Infield, D. *Renewable Energy in Power Systems*, John Wiley & Sons, Ltd., 2008.
3.	Kreith, F., Kreider, J. F., *Principles of Sustainable Energy*, CRC Press, 2011.
4.	Crawley, G.M., *The World Scientific Handbook of Energy*,World Scientific, 2013
5.	Boyle, B., *Renewable Energy*, Oxford University Press, 2012.
6.	Wong, M.H., Lee, F., W. K., Fung, M.K.F., 2006. Environmental Principles and Ethics - Textbooks. World Scientific Publishing Co. Pte. Ltd.
7.	Cunningham, W.P., Cunningham, M.A., 2008. Environmental Science - A Global Concern, 10th ed. McGraw-Hill International Edition.
8.	Technology for Biobased Products Online course by Delft University of Technology (TU Delft) https://www.edx.org/course/technology-biobased-products-delftx-tbp01x#.VJ6LVrAQ
9.	Energy Principles and Renewable Energy Online course by University of Queensland (UQ) https://courses.edx.org/courses/course-v1:UQx+ENGY0x+3T2018/course/