City University of Hong Kong
Course Syllabus

offered by School of Energy and Environment
with effect from Semester A 2021/22

Part I Course Overview

Course Title:	Power Plant Engineering
Course Code:	SEE3102
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)*	SEE2001 Electromagnetic Principles for Energy Engineers or equivalent; and SEE2101 Engineering Thermofluids I or equivalent
Precursors: *(Course Code and Title)*	SEE2002 Chemical Sciences for Energy and Environmental Engineers or equivalent
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 the general knowledge and engineering principles of conventional power plants. The course will emphasise on energy resources such as fossil fuels, nuclear and hydroelectric. Electric generators, corresponding devices and technologies for power generation, distribution and transmission 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.	Calculate energy output and study gas emission from various fuel sources	20		√	
2.	Describe the principles of heat engines and analyse energy conversion efficiency	30		√	
3.	Explain the mechanisms of various power plant systems, and evaluate the power generation level for different applications.	10		√	
4.	Identify different kinds of power generators, and evaluate the application occasions of different generators.	10		√	
5.	Analyze power transmission and distribution systems, and describe the basic concepts and principles of modern grid systems.	30	√	√	
		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	Explain key concepts, including principles of heat engines, theories related to electricity generation and distribution	√	√	√	√	√		2.5 hrs/wk
Tutorial, class demo	Solidify students' concepts and principles with practice	√	√	√	√	√		0.5 hr/wk

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___%								
In-class test Students will complete a midterm test to demonstrate their learning ability to apply their knowledge in power combustion and generation problems.	√	√					20%	
Assignment Several assignments will be given throughout the semester. Students need to complete the assignments to demonstrate their ability to apply their knowledge in fuel combustion, energy output, heat engines, power generation ways, power generators, power transmission, power distribution, and modern power grids.	√	√	√	√	√		30%	
Examination: _50___% (duration: 2 hours , if applicable) Final exam will be given to test students' ability to apply their knowledge learned in power generation, transmission and distribution.								
** The weightings should add up to 100%.*							100%	

Examination duration: 2 hrs

Percentage of coursework, examination, etc.: 50% by coursework; 50% 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 test	Ability to analyse and solve problems related toenergy supply, power combustion and generation.	Excellent analysis and problem solving skills to demonstrate in-depth understanding of energy supply, power combustion and generation	Good analysis and problem solving skills to demonstrate good understanding of energy supply, power combustion and generation	Acceptable analysis and problem solving skills to demonstrate adequate understanding of energy supply, power combustion and generation	Marginally acceptable analysis and problem solving skills to demonstrate some understanding of energy supply, power combustion and generation	Poor analysis and problem solving skills and is barely able to demonstrate an understanding of energy supply, power combustion and generation
2. Assignment	Ability to evaluate and analyse questions related to fuel combustion, power generation, engines, generators, power transmission and distribution.	Excellent analysis and problem solving skills to demonstrate in-depth understanding of fuel combustion, power generation, engines, generators, power transmission and distribution.	Good analysis and problem solving skills to demonstrate good understanding of fuel combustion, power generation, engines, generators, power transmission and distribution.	Acceptable analysis and problem solving skills to demonstrate adequate understanding of fuel combustion, power generation, engines, generators, power transmission and distribution.	Marginally acceptable analysis and problem solving skills to demonstrate some understanding of fuel combustion, power generation, engines, generators, power transmission and distribution.	Poor analysis and problem solving skills and is barely able to demonstrate an understanding of fuel combustion, power generation, engines, generators, power transmission and distribution.

3. Final exam	Ability to analyse and solve problems related to fuel combustion, power generation, engines, generators, power transmission and distribution.	Excellent analysis and problem solving skills to demonstrate in-depth understanding of fuel combustion, power generation, engines, generators, power transmission and distribution	Good analysis and problem solving skills to demonstrate good understanding of fuel combustion, power generation, engines, generators, power transmission and distribution	Acceptable analysis and problem solving skills to demonstrate adequate understanding of fuel combustion, power generation, engines, generators, power transmission and distribution	Marginally acceptable analysis and problem solving skills to demonstrate some understanding of fuel combustion, power generation, engines, generators, power transmission and distribution	Poor analysis and problem solving skills and is barely able to demonstrate an understanding of fuel combustion, power generation, engines, generators, power transmission and distribution

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.)

- Fossil fuel based energy:
  - Coal; Fuel gas; Oil
  - Combustion, air-fuel ratio
  - Heat engine, Steam generators; Steam turbines; Gas turbines, power plant
- Nuclear power:
  - Nuclear reactor; Uranium; Fission; Nuclear waste management
- Hydro-electric power plant
- Power generation and electric generators
- Power transmission and distribution
  - Switches, cables, fuses, transformers, converters
  - three phases, power factor, harmonics
  - High voltage DC
  - Smart grid
  - Power 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.)

2.2 Additional Readings

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

1.	F.M. Vanek and L.D. Albright, *Energy Systems Engineering – Evaluation & Implementation*, McGraw-Hill, second edition, 2012.
2.	A.W. Culp, *Principles of Energy Conversion*, McGraw-Hill, 1991.
3.	A.K. Raja, A. P. Srivastava, M. Dwivedi, *Power Plant Engineering*, New Age International (P) Ltd., 2006.
4.	P.K. Nag, *Power Plant Engineering*, McGraw-Hill, 2001.
5.	C. King, *Thermal Power Plant Cooling Context and Engineering of*, ASME, 2014.
6.	J.R. Lamarsh and A.J. Baratta, *Introduction to Nuclear Engineering*, 3rd Ed., Prentice Hall, 2001.
7.	D. Buchla, T. Kissell, T. Floyd, *Renewable Energy Systems*, Pearson, 2015