City University of Hong Kong
Course Syllabus

offered by School of Energy and Environment
with effect from Semester A 2022/23

Part I Course Overview

Course Title:	Solid Waste Treatment and Management
Course Code:	SEE6214
Course Duration:	One Semester
Credit Units:	3
Level:	P6
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
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 up-to-date knowledge on topics relating to waste management and processing. It details the current methods of managing solid waste and discusses technologies include waste collection, transfer, recycling, waste-to-energy, bio-energy, incineration, hazardous waste management and landfill disposal. Specific waste valorisation techniques for various industrial waste streams, and a comparison of existing chemical/thermal techniques with bio-based, green chemistry processes and/or novel-assisted techniques will be provided. Students will learn to design an integrated waste management system for source reduction and disposal by combining the available options. Sustainable development and life-cycle assessment will be discussed in relationship to waste management.

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.	Explain existing methods to manage and process solid waste	20%		✓	
2.	Analyse physical, chemical, and biological properties of solid waste and evaluate available biological and thermal treatment technologies	25%		✓	
3.	Describe and analyse recycling and waste-to-energy technologies and other sustainable developments	20%	✓		
4.	Apply life cycle analysis to design integrated solid waste management and treatment system	20%			✓
5.	Identify the challenges in waste valorisation by applying appropriate techniques for treatment of various waste streams	15%		✓	
		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	Explain the key concepts of solid and hazardous waste management, treatment technologies	✓	✓	✓	✓	
Tutorial, case study, in-class exercises	Introduction of latest incineration, energy recovery, solid waste recycling and technologies	✓	✓	✓	✓	

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: 60%							
Assignment	✓	✓	✓			20%	
Project Presentation	✓	✓	✓	✓	✓	10%	
Mid-term test		✓	✓	✓		30%	
Examination: 40% (duration: 2 hours, if applicable)							
						100%	

Examination duration: 2 hours

Percentage of coursework, examination, etc.: 30% by coursework; 30% by mid-term test and 40% by examination

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.)

Applicable to students admitted in Semester A 2022/23 and thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Assignment	Ability to evaluate and analyze waste management technologies	High	Significant	Moderate to Basic	Not even reaching marginal levels
2. Project Presentation	Ability to design sustainable solutions to the problem of MSW management	High	Significant	Moderate to Basic	Not even reaching marginal levels
3. Final Examination	Ability to provide engineering solutions to integrated waste treatment and management system	High	Significant	Moderate to Basic	Not even reaching marginal levels
5. Mid-term test	Ability to provide engineering solutions to integrated waste treatment and management system	High	Significant	Moderate to Basic	Not even reaching marginal levels

Applicable to students admitted before Semester A 2022/23

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Assignment	Ability to evaluate and analyze waste management technologies	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Project Presentation	Ability to design sustainable solutions to the problem of MSW management	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Final Examination	Ability to provide engineering solutions to integrated waste treatment and management system	High	Significant	Moderate	Basic	Not even reaching marginal levels
5. Mid-term test	Ability to provide engineering solutions to integrated waste treatment and management system	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.)

- Municipal, industrial and construction solid waste treatment
- Principles of waste collection and treatment process and design
- Sludge disposal, landfill and related pollution problems
- Technologies associated with hazardous waste treatment
- Waste to energy technologies – bio-energy, incineration, etc.
- Recycling – metal, plastic, glass, etc.
- Sustainable development and waste management (source control, sorting, policy, charging scheme, etc.)
- Green and sustainable chemistry in waste valorisation, waste-based biorefinery and circular economy

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.	WORRELL W.A. and VESILIND P.A. (2012) Solid Waste Engineering, 2nd ed. Connecticut: Cengage Learning.
2.	Municipal Solid Waste Management in Developing Countries developed by École Polytechnique Fédérale de Lausanne in Coursera https://www.coursera.org/learn/solid-waste-management/

2.2 Additional Readings

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

1.	CHRISTENSEN, T. (ed.) (2010) Solid Waste Technology & Management. New Jersey: John Wiley & Sons, Ltd.
2.	http://www.epd.gov.hk/epd/english/environmentinhk/waste/waste_maincontent.html
3.	Hong Kong BLUEPRINT FOR SUSTAINABLE USE OF RESOURCES 2013 – 2022 http://www.enb.gov.hk/en/files/WastePlan-E.pdf
4.	Kosseva, M.R., Webb, C. (2020) Food Industry Wastes: Assessment and Recuperation of Commodities 2nd Edition, Academic Press. San Diego, USA.https://www.sciencedirect.com/book/9780128171219/food-industry-wastes#book-info