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:	Waste and Wastewater Treatment Engineering
Course Code:	SEE4217
Course Duration:	One semester
Credit Units:	3
Level:	B4
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)*	SEE2002 Chemical Sciences for Energy and Environmental Engineers; and SEE2201 Fundamentals of Environmental Engineering
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

(A 150-word description about the course)

To introduce students to the principles of municipal wastewater and solid waste treatment and management. The students will learn the fundamental concepts in wastewater treatment technologies, hazardous solid waste disposal and management issues related to sludge treatment and disposal. This will also be combined with the process design skills related to both wastewater treatment and sewerage systems.

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 unit processes associated with the municipal solid waste and wastewater treatment systems.	30%		√	
2.	Explain the principles of wastewater treatment and apply the knowledge in the process design.	30%		√	
3.	Evaluate the significance and the main technologies associated with hazardous waste treatment and disposal.	20%		√	
4.	Identify specific pollution problems associated with sludge disposal, contaminated land and landfill.	20%		√	
		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	
Lectures	Explain key concepts and principles related to waste and wastewater treatment engineering and the design of processes and systems	✓	✓	✓	✓	
Tutorials	Solidify students' concepts and understanding with practice	✓	✓	✓	✓	
Field trip	Visit to wastewater and/or sludge treatment facilities	✓	✓			

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 Several assignments will be given throughout the semester. Through the assignments, students will demonstrate their understanding of the underlying concepts of waste and wastewater treatment, engineering system design and operation.	✓	✓	✓	✓	25%	
Test Students will complete a mid-term test to demonstrate their ability to apply knowledge to analyze and solve problems related to waste and wastewater treatment engineering.	✓	✓	✓	✓	25%	
Examination: __50__% (duration: 2 hours , if applicable) Final exam will test students' ability to integrate knowledge learned throughout the course to analyze and solve problems related to waste and wastewater treatment engineering.						
** 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. Assignments	Ability to explain concepts, analyze and solve problems related to waste and wastewater treatment engineering	Excellent understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Good understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Acceptable understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Marginally acceptable understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Poor understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering
2. Test	Ability to explain concepts, analyze and solve problems related to waste and wastewater treatment engineering	Excellent understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Good understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Acceptable understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Marginally acceptable understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Poor understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering
3. Examination	Ability to explain concepts, analyze and solve problems related to waste and wastewater treatment engineering	Excellent understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Good understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Acceptable understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Marginally acceptable understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering	Poor understanding of concepts and ability to analyze and solve problems related to waste and wastewater treatment engineering

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.)

- Classification, significance of impurities in water and wastewater: suspended and dissolved solids, organic and inorganic, trace contaminants and pathogens.
- Physical methods for removing particulates: screening, sedimentation and filtration.
- Chemical dosing: precipitation; coagulation and flocculation processes; including basic concepts from colloid science; disinfection and chemical oxidation.
- Adsorption and ion exchange.
- Biological processes for wastewater treatment: aerobic and anaerobic. Activated sludge, trickling filters and sludge digestion.
- Process control strategies.
- Examples of flow sheets and unit operations used in treatment plants.
- Sources, types and composition of municipal solid wastes
- Physical, chemical and biological properties of municipal solid waste
- Waste handling, separation, storage and processing at source/collection of solid waste
- Incineration of solid waste for energy generation
- Thermal and biological conversion technologies for waste treatment
- Disposal of solid wastes and residual matter

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.	
2.	
3.	

2.2 Additional Readings

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

1.	Metcalf & Eddy, Tchobanoglous, G., Burton, F. L. and Stensel, H. D. 2013. Wastewater Engineering: Treatment and Resource Recovery (5th ed). McGraw-Hill.
2.	Davis, M. L. 2010. Water and Wastewater Engineering: Design Principles and Practice. McGraw-Hill.
3.	Thomas Christensen, *Solid Waste Technology and Management*, John Wiley & Sons, Ltd. 2010.