

**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:	Wastewater Engineering and Water Quality Assessment
Course Code:	SEE8221
Course Duration:	One semester
Credit Units:	3
Level:	R8
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites:	Nil
Precursors:	Nil
Equivalent Courses:	SEE6213 Wastewater Engineering and Water Quality Assessment
Exclusive Courses:	Nil

Part II Course Details

1. Abstract

The course aims to provide students with the fundamental knowledge on wastewater engineering processes as well as the analytical techniques involved in assessing water quality. State-of-the-art processes in wastewater treatment will also be covered in the course.

2. Course Intended Learning Outcomes (CILOs)

No.	CILOs	Weighting (if applicable)	Discovery-enriched curriculum related learning outcomes (please tick where appropriate)		
			A1	A2	A3
1.	Identify and classify the different sources of wastewater and their requirement for treatment depending on their discharge or final utilisation.	10%	√		
2.	Describe and perform various analysis of water and wastewater quality assessment.	20%		√	
3.	Design the various physical and chemical unit operations for wastewater treatment.	20%		√	
4.	Design the various biological unit operations for wastewater treatment.	20%		√	
5.	Describe the principles of various advanced treatment, concepts of water recycling and desalination.	30%			√
		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)

TLA	Brief Description	CILO No.						Hours/week (if applicable)
		1	2	3	4			
Lectures	The lectures will cover basic theories and concepts of wastewater treatment and control methods, techniques and operations of waste treatment plants, and management systems commonly use in Hong Kong.	√	√	√	√		2	Lectures
Tutorial	Open discussions in tutorial sessions will be given to students on engineering calculation procedure and formulation		√	√	√		1	Tutorial

	techniques.							
Laboratory	Analysis water quality and understand its impact on environment		√					Laboratory
Field visit	Recognize the contemporary technology at national levels in addressing environment problems and issues				√			Field visit
Mini projects	Develop innovative and creative solutions to wastewater treatment through teamwork and projects					√		Mini projects

4. Assessment Tasks/Activities (ATs)

Assessment Tasks/Activities	CILO No.						Weighting	Remarks
	1	2	3	4	4	5		
Continuous Assessment: <u>70</u> %								
Assignments		√	√	√			20	
Project					√		30	
Quiz	√	√	√	√			20	
Examination: <u>30</u> % (duration: 2 hours, if applicable)								
							100%	

5. Assessment 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)
Assignments	Graded assignment in each topic with both calculations and structured problem solving	The student completes all assessment tasks/activities and the work demonstrates excellent understanding of the scientific principles and the working mechanisms	The student completes all assessment tasks/activities and can describe and explain the scientific principles.	The student completes all assessment tasks/activities but can only briefly describe some scientific principles.	The student fails to complete all assessment tasks/activities
Test	Comprehensive paper examination with both calculations and structured problem solving in evaluating student's learning abilities	He/she can thoroughly identify and explain how the principles are applied to wastewater engineering.	He/she provides a detailed evaluation of how the principles are applied to wastewater engineering.	Only some of the analysis is appropriate to show how the principles are applied to wastewater engineering.	He/she fails to identify and explain how the principles are applied to wastewater engineering.
Mini Project	Analyse and provide innovative engineering solution in wastewater treatment	He/she is able to communicate ideas effectively and persuasively via written texts and/or oral presentation.	He/she is able to communicate ideas effectively via written texts and/or oral presentation.	He/she can communicate simple ideas in writing and/or in oral presentations.	He/she is weak in communicating ideas and/or the student's work shows evidence of plagiarism.

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)
Assignments	Graded assignment in each topic with both calculations and structured problem solving	The student completes all assessment tasks/activities and the work demonstrates excellent understanding of the scientific principles and the working mechanisms	The student completes all assessment tasks/activities and can describe and explain the scientific principles.	The student completes all assessment tasks/activities and can describe and explain some scientific principles.	The student completes all assessment tasks/activities but can only briefly describe some scientific principles.	The student fails to complete all assessment tasks/activities
Test	Comprehensive paper examination with both calculations and structured problem solving in evaluating student's learning abilities	He/she can thoroughly identify and explain how the principles are applied to wastewater engineering.	He/she provides a detailed evaluation of how the principles are applied to wastewater engineering.	He/she provides simple but accurate evaluations of how the principles are applied to wastewater engineering.	Only some of the analysis is appropriate to show how the principles are applied to wastewater engineering.	He/she fails to identify and explain how the principles are applied to wastewater engineering.
Mini Project	Analyse and provide innovative engineering solution in wastewater treatment	He/she is able to communicate ideas effectively and persuasively via written texts and/or oral presentation.	He/she is able to communicate ideas effectively via written texts and/or oral presentation.	He/she can communicate ideas clearly in written texts and/or in oral presentations.	He/she can communicate simple ideas in writing and/or in oral presentations.	He/she is weak in communicating ideas and/or the student's work shows evidence of plagiarism.

Part III Other Information

1. Keyword Syllabus

- Composition and classification of wastewater
- Analytical techniques in water quality assessment
- Physical unit operations – sedimentation, flocculation, flotation
- Chemical unit operations – aeration, pH, chlorination, ion exchange
- Biological treatment – aerobic/anaerobic treatment, activated sludge, trickling filter
- Membrane bioreactor (MBR)
- Advanced oxidation processes – ozone, UV, Fenton, photo-Fenton, photocatalysis
- Water recycling and desalination

2. Reading List

2.1 Compulsory Readings

1.	Metcalf and Eddy /Aecom, Wastewater Engineering: Treatment and Resource Recovery 5th Edition, McGraw-Hill International Edition, 2014.
2.	MIHELICIC, J.R. and ZIMMERMAN, J.J. (2009) Environmental Engineering: Fundamentals, Sustainability, Design. New Jersey: John Wiley & Sons, Ltd.

2.2 Additional Readings

1.	MACKENZIE , D. (2010) <i>Water and Wastewater Engineering</i> . New York: McGraw-Hill, Ltd.
2.	METCALF & EDDY: AECOM, Inc. (2007) <i>Water Reuse: Issues, Technologies, and Applications</i> , New York: McGraw-Hill, Ltd.
3.	IZRAIL, S., TUROVSKIY, P. and MATHAI, K. (2006) <i>Wastewater Sludge Processing</i> . New Jersey: John Wiley & Sons, Ltd.
4.	RUSSELL, D.L. (2006) <i>Practical Wastewater Treatment</i> . New Jersey: John Wiley & Sons, Ltd.