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:	Water and Water Resource Engineering
Course Code:	SEE4218
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)*	SEE1003 Introduction to Sustainable Energy and Environmental Engineering; SEE2002 Chemical Sciences for Energy and Environmental Engineers; OR 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)

This course aims to introduce the theory and application of physical and chemical processes for the improvement of water quality in engineered water treatment plants and natural aquatic systems. The students will learn to design, engineer and analyze water treatment systems and the energy requirements will be considered. The latest innovative technologies used in water treatment 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 the water quality standards	10%		√	
2.	Design and analyze water treatment reactors	30%		√	
3.	Apply physical processes to improve water quality	25%		√	
4.	Apply chemical processes to improve water quality	25%		√	
5.	Analyze the energy demand of treatment systems and understand the latest innovative technologies	10%	√	√	
		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	
Lectures	Explain basic theories and concepts of water treatment and control	✓	✓	✓	✓	✓	2
Tutorials	Require students to practice engineering calculation and formulation techniques	✓	✓	✓	✓	✓	1
Field trip	Broaden students' understanding of concepts through field trip visit to nearby water 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	5		
Continuous Assessment: __60__%							
Assignments Several assignments will be given to assess student's understanding of the theories and concepts for water treatment, including engineering system design, controls, and operation	✓	✓	✓	✓	✓	60%	
Examination: __40__% (duration: 2 hours , if applicable) Final exam will test students' ability to demonstrate knowledge learned throughout the course to analyze and solve problems related to water and water resource engineering.							
** The weightings should add up to 100%.*						100%	

Examination duration: 2 hrs
Percentage of coursework, examination, etc.: 60% by coursework; 40% 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 describe the water quality standards and analyze water treatment system Ability to estimate the energy demand of treatment systems and understand the latest innovative technologies	Excellent understanding of concepts and ability to analyze and solve problems related to water and water resource engineering	Good understanding of concepts and ability to analyze and solve problems related to water and water resource engineering	Acceptable understanding of concepts and ability to analyze and solve problems related to water and water resource engineering	Marginally understanding of concepts and ability to analyze and solve problems related to water and water resource engineering	Poor understanding of concepts and ability to analyze and solve problems related to water and water resource engineering
2. Examination	Ability to provide engineering solutions and to design a water treatment system Apply chemical and physical processes to improve water quality	Excellent understanding of concepts and ability to analyze and solve problems related to water and water resource engineering	Good understanding of concepts and ability to analyze and solve problems related to water and water resource engineering	Acceptable understanding of concepts and ability to analyze and solve problems related to water and water resource engineering	Marginally understanding of concepts and ability to analyze and solve problems related to water and water resource engineering	Poor understanding of concepts and ability to analyze and solve problems related to water and water resource 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.)

Water quality standards; properties of water contaminants; reactor theory; mass balances; reaction kinetics; gas transfer; adsorption; particle characterization; particle processes; flocculation; filtration; gravity separations; membrane processes; disinfection; energy demand

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.	Mackenzie L. Davis (2011) Water and wastewater engineering: design principles and practice. New York : McGraw-Hill.
2	Lawler, D. and M. Benjamin. 2003. Water Quality Engineering: Physical and Chemical Treatment Processes. McGraw-Hill.
3.	American Water Works Association and J. Edzwald. 2010. Water Quality and Treatment: A Handbook on Drinking Water, 6th ed. McGraw-Hill.

2.2 Additional Readings

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

1.	METCALF & EDDY: AECOM, Inc. (2007) Water Reuse: Issues, Technologies, and Applications, New York: McGraw-Hill, Ltd.
2.	David Hendricks (2010) Fundamentals of Water Treatment Unit Processes: Physical, Chemical, and Biological. IWA Publishing, CRC press