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:	Chemical Separations for Energy and Environmental Applications
Course Code:	SEE4122
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)*	SEE2101 Engineering Thermofluids I; and SEE3101 Engineering Thermofluids II
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 educate students on the fundamental principles of chemical separation technologies essential to energy and environment-related applications that enable to achieve sustainable development. The course will include both equilibrium-controlled separation processes and separation processes that involve both mass transport and equilibrium considerations. The students will learn the basic concepts in molecular separation (especially for mixtures of gases and vapours) and how separation processes work as well as develop ability to use the basic knowledge learned to provide solutions to timely important separation problems in the field of energy and environment.

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 importance of chemical separation and its relevance to enabling key energy and environmental applications for building a sustainable society	20%	√		
2.	Describe the concepts and principles of chemical separation processes with both equilibrium and non-equilibrium considerations.	40%		√	
3.	Apply the concepts and principles of chemical separation technologies to provide solutions to key energy and environment-related applications	40%		√	
		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	
Lectures	Explain key concepts and principles of chemical separation technologies	✓	✓	✓	
Tutorials	Solidify students' understanding of key concepts and principles via practice and tacking confusions or difficulties encountered in the lectures and exercises	✓	✓	✓	

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		
Continuous Assessment: _50___%					
Assignments Several assignments will be given throughout the semester. Through the assignments, students will demonstrate their understanding of the underlying concepts and principles of chemical separation processes.	✓	✓	✓	30%	
Test Students will complete a mid-term test to demonstrate their ability to apply their knowledge to analyze and solve problems related to chemical separation processes.	✓	✓	✓	20%	
Examination: __50__% (duration: 2 hours, if applicable)					
** 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 chemical separation processes	Excellent understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Good understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Acceptable understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Marginally acceptable understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Poor understanding of concepts and ability to analyze and solve problems related to chemical separation processes
2. Test	Ability to explain concepts, analyze and solve problems related to chemical separation processes	Excellent understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Good understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Acceptable understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Marginally acceptable understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Poor understanding of concepts and ability to analyze and solve problems related to chemical separation processes
3. Examination	Ability to explain concepts, analyze and solve problems related to chemical separation processes	Excellent understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Good understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Acceptable understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Marginally acceptable understanding of concepts and ability to analyze and solve problems related to chemical separation processes	Poor understanding of concepts and ability to analyze and solve problems related to chemical separation processes

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.)

Chemical separation, molecular discrimination, distillation, absorption and stripping, adsorption, membrane, thermodynamic equilibrium, mass transfer, porous materials, absorbents, adsorbents, selectivity, permeability.

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.)

Nil

2.2 Additional Readings

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

1.	Wankat, Phillip C., Separation Process Engineering Second Edition, Pearson Education, Inc. 2007
2.	Seader, Henley and Roper, Separation Process Principles with Applications Using Process Simulators, 4th Edition, John Wiley and Sons, Inc. 2016
3.	Giddings, J. Calvin, Unified separation science, Wiley, New York, 1991