City University of Hong Kong
Course Syllabus

offered by School of Energy and Environment
with effect from Semester A 2019/20

Part I Course Overview

Course Title:	Environmental Systems Modelling
Course Code:	SEE4204
Course Duration:	1 semester
Credit Units:	3 credits
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)*	MA2181 Mathematical Methods for Engineering; SEE1002 Introduction to Computing for Energy and Environment; AND SEE2003 Introduction to Energy and Environmental Data Analysis
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 instruct students to learn how environmental phenomena works as systems and how to use models to better understand the environmental systems and to solve environmental problems. Students will learn basic concepts and strategies for building simple models, designing model experiments, and evaluating model results. Various environmental applications using modelling from a variety of disciplines (e.g. air and water) will also be introduced.

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 modelling aspects of environmental systems	10%	✓		
2.	Demonstrate principles and concepts underlying environmental models	40%	✓		
3.	Apply simple model simulations to explain environmental phenomena	20%		✓	✓
4.	Design modelling strategies to solve environmental problems	30%		✓	✓
** If weighting is assigned to CILOs, they should add up to 100%.*		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	
Lecture	Explain key concepts, such as principles related to environmental modelling	✓	✓			
Tutorial / Computational Labs	Hands-on training on environmental modelling application		✓	✓	✓	

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: _60_%						
Assignment	✓	✓	✓		35%	
Term Project			✓	✓	25%	
Examination: __40__% (duration: 2 hours , if applicable)						
** The weightings should add up to 100%.*					100%	

Examination duration: 2 hours
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. Assignment	Ability to describe the principles and mechanisms, and solve problems related to environmental systems modelling	High	Significant	Moderate	Basic	Not even reaching marginal levels
2. Term project	Ability to design modelling strategies for a real-world environmental problem	High	Significant	Moderate	Basic	Not even reaching marginal levels
3. Final exam	Ability to explain concepts and solve problems	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.)

Environmental systems

Systems thinking; Environmental behaviour pattern; Feedback

Model building and equations

Pollution transport; Continuity equation; Dynamic modelling; Kinetic modelling; Data-based mechanistic modelling; Eulerian model; Lagrangian approaches; Python, R language and/or MATLAB

Strategies for environmental systems modelling

Model experiment design; Environmental data; Model validation

Application in environmental systems modelling

Matter cycling; Water quality model; Atmospheric model; Ecosystem model; Case study

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.	Wainwright, J. (2012). *Environmental Modelling: Finding Simplicity in Complexity 2nd Edition.* West Sussex, UK: Wiley.
2.	Deaton, M. (2000). *Dynamic Modelling of Environmental Systems,* Springer, 2000.