City University of Hong Kong
Course Syllabus

offered by Department of Chemistry
with effect from Semester A 2024/25

Part I Course Overview

Course Title:	Environmental Health and Risk Assessment
Course Code:	CHEM6128
Course Duration:	1 semester
Credit Units:	3 credits
Level:	P6
Medium of Instruction:	English
Medium of Assessment:	English
Prerequisites: *(Course Code and Title)*	Nil
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

Environmental Risk Assessments (ERAs) are a tool to determine the likelihood that contaminant releases or stressors, either past, current, or future, pose an unacceptable risk to human health, wildlife or the environment. Currently, ERAs are required under various regulations in many developed countries so as to support decision-makers in risk characterization, food safety management or the selection of cost-effective remedial clean-up. This course introduces the theory and practice of human and ecological risk assessments. Students completing the course will gain a sound knowledge of the concepts and principles of ERAs, risk management and risk communication as applied in practice; understand the basic risk assessment tools (i.e. prospective, retrospective and tiered approaches) to environmental risk management; be able to select and apply the basic tools to tackle risk issues; and appreciate the interpretations of risk and its role in environmental policy formulation and decision making.

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.	Gain a sound knowledge of the concepts & principles of Environmental risk assessments (ERAs), and management & communication as applied in practice.	30%	✓	✓	
2.	Understand the basic risk assessment tools (i.e. prospective, retrospective and tiered approaches) to environmental risk management.	30%	✓	✓	
3.	Be able to select and apply the basic tools to tackle risk issues.	20%		✓	✓
4.	Appreciate the interpretations of risk and its role in environmental policy formulation and decision making.	20%		✓	✓
		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 real-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. Learning and Teaching Activities (LTAs)

(LTAs designed to facilitate students' achievement of the CILOs.)

LTA	Brief Description	CILO No.				Hours/week (if applicable)
		1	2	3	4	
Lectures	The students will learn from lectures which will cover the following topics: Introduction to Environmental Risk Assessment (ERA); Prospective ERA for chemical substances and derivation of predicted no effect concentrations (PNECs); Tiered Prospective ERA for contaminated mud disposal; Retrospective ERA: A case study related to oyster farming; Human health risk assessment associated with e-waste; Assessment of ecological risks of chemical contaminants on wildlife; ERA for biological invasion; Seafood safety; Risk communication; Regional-based ERA.	✓	✓	✓	✓	
Laboratory sessions	Students will work as a team to conduct a standard toxicity test and compute the toxicity endpoint.			✓	✓	
Examination	Students will participate in a written examination which will be designed to assess their understanding and ability to apply subject related knowledge learned in this course.	✓	✓	✓	✓	
Self-directed study	Students will also learn through reading the course materials which include reference books, journal articles and governmental reports; such reading tasks will facilitate students' self-directed learning.	✓	✓	✓	✓	
Coursework	Students will be engaged in learning through individual assignment, group project and lab report writing.	✓	✓	✓	✓	

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%						
Individual Assignment: Scientific derivation of predicted no effect concentration of a selected toxic substance.	✓	✓			10%	
Laboratory Report: Reporting the laboratory toxicity test results in a professional manner.	✓	✓			25%	
Group Project: Providing a summary and critical review on a report related to the regional environmental risk assessment via an oral presentation with PowerPoint slides (20 min. + 5 min. Q&A).	✓	✓	✓	✓	25%	
Examination: 40% (duration: 2 hours)						
Examination: Students will be assessed via the examination their understanding of concepts learned in class, reading materials and their ability to apply subject related	✓	✓	✓	✓	40%	

knowledge.						
					100%	

Starting from Semester A, 2015-16, students must satisfy the following minimum passing requirement for courses offered by CHEM:
"A minimum of 40% in both coursework and examination components."

5. Assessment Rubrics

(Grading of student achievements is based on student performance in assessment tasks/activities with the following rubrics.)

Applicable to students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B, B-)	Fair (C+, C, C-)	Marginal (D)	Failure (F)
1. Individual Assignment	• Ability to apply the acquired knowledge and computational skills in solving a real-life problem; • Ability to communicate effectively in writing.	**High** Able to correctly apply the acquired knowledge and computational skills to solve a real-life problem; and communicate effectively through report writing.	**Significant** Able to apply the acquired knowledge and computational skills to solve a real-life problem with few errors; and communicate effectively through report writing.	**Moderate** Able to apply the acquired knowledge and computational skills to solve a real-life problem some errors; and communicate adequately through report writing with few errors.	**Basic** Able to apply some of the acquired knowledge and computational skills to solve a real-life problem a few errors; and communicate through report writing with some errors.	**Not even reaching marginal levels** Unable to apply the acquired knowledge and computational skills to solve a real-life problem; and unable to communicate adequately through report writing.
2. Laboratory Report	• Ability to work as a team and conduct the standard toxicity test and associated calculations; • Ability to analyse the results and think critically; • Ability to conduct literature review and cite related references; • Ability to communicate effectively in writing.	**High** Able to work as a team and conduct the experiment and associated calculations; Able to carefully analyse the results and think critically; Able to conduct literature	**Significant** Able to work as a team and conduct the experiment and associated calculations with few errors; Able to analyse the results and think critically; Able to conduct literature	**Moderate** Able to work as a team and conduct the experiment and associated calculations with some errors; Able to analyse the results; Able to conduct literature review and cite	**Basic** Able to work as a team and conduct the experiment and associated calculations with a few errors; Able to analyse the results with few errors; Able to conduct literature	**Not even reaching marginal levels** Able to work as a team and conduct the experiment and associated calculations with many errors; Unable to analyse the results and think critically;

		review and cite relevant references; and able to communicate effectively in report writing.	review and cite relevant references; and able to communicate effectively in report writing.	relevant references; and able to communicate adequately in report writing.	review and cite relevant references; and able to communicate in report writing.	unable to conduct literature review and cite relevant references; and unable to communicate adequately in report writing.
3. Group Project	• Ability to work as a team and organise the task; • Ability to conduct literature review; • Ability to understand, interpret, analyse and synthesize the report on a regional ERA; • Ability to use the acquired knowledge to evaluate the pros and cons of the report with critical thinking; • Ability to communicate effectively in oral; • Ability to handle unseen questions.	**High** Able to work as a team and organise the task very well; able to conduct literature review; able to fully understand, interpret, analyse and synthesize the report; able to fully use the acquired knowledge to evaluate the pros and cons of the report with critical thinking; able to communicate effectively in oral; and handle unseen questions very	**Significant** Able to work as a team and organise the task well; able to conduct literature review; able to understand, interpret, analyse and synthesize the report; able to adequately use the acquired knowledge to evaluate the quality of the report with critical thinking; able to communicate effectively in oral; and handle unseen questions well.	**Moderate** Able to work as a team and organise the task reasonably well; able to conduct literature review; able to partially understand, interpret, analyse and synthesize the report; able to partially use the acquired knowledge to evaluate the quality of the report with critical thinking; able to communicate in oral; and handle unseen questions with	**Basic** Able to work as a team and organise the task; able to conduct literature review with limited effort; able to partially understand, interpret, analyse and synthesize the report; able to use limited acquired knowledge to evaluate the quality of the report with limited critical thinking; able to communicate in oral; and handle unseen	**Not even reaching marginal levels** Able to work as a team but poorly organise the task; unable to conduct literature review; fail to understand, interpret, analyse and synthesize the report; unable to use the acquired knowledge to evaluate the quality of the report with critical thinking; able to communicate in oral; and handle unseen

		well.		few errors.	questions with some errors.	questions with a few errors.
4. Final Examination	• Ability to understand the subject matter; • Apply to apply the learnt knowledge and computational skills in solving problems; • Ability to communicate effectively in writing.	**High** Able to correctly answer almost all the examination questions precisely and concisely with no errors.	**Significant** Able to correctly answer a substantial number of the examination questions precisely and concisely with no errors.	**Moderate** Able to correctly answer most of the examination questions precisely and concisely with only a few errors.	**Basic** Able to correctly answer a few examination questions with some errors.	**Not even reaching marginal levels** Unable to correctly answer most of the examination questions.

Applicable to students admitted from Semester A 2022/23 to Summer Term 2024

Assessment Task	Criterion	Excellent (A+, A, A-)	Good (B+, B)	Marginal (B-, C+, C)	Failure (F)
1. Individual Assignment	• Ability to apply the acquired knowledge and computational skills in solving a real-life problem; • Ability to communicate effectively in writing.	**High** Able to correctly apply the acquired knowledge and computational skills to solve a real-life problem; and communicate effectively through report writing.	**Significant** Able to apply the acquired knowledge and computational skills to solve a real-life problem with few errors; and communicate effectively through report writing.	**Moderate** Able to apply the acquired knowledge and computational skills to solve a real-life problem some errors; and communicate adequately through report writing with few errors.	**Not even reaching marginal levels** Unable to apply the acquired knowledge and computational skills to solve a real-life problem; and unable to communicate adequately through report writing.

2. Laboratory Report	• Ability to work as a team and conduct the standard toxicity test and associated calculations; • Ability to analyse the results and think critically; • Ability to conduct literature review and cite related references; • Ability to communicate effectively in writing.	**High** Able to work as a team and conduct the experiment and associated calculations; Able to carefully analyse the results and think critically; Able to conduct literature review and cite relevant references; and able to communicate effectively in report writing.	**Significant** Able to work as a team and conduct the experiment and associated calculations with few errors; Able to analyse the results and think critically; Able to conduct literature review and cite relevant references; and able to communicate effectively in report writing.	**Moderate** Able to work as a team and conduct the experiment and associated calculations with some errors; Able to analyse the results; Able to conduct literature review and cite relevant references; and able to communicate adequately in report writing.	**Not even reaching marginal levels** Able to work as a team and conduct the experiment and associated calculations with many errors; Unable to analyse the results and think critically; unable to conduct literature review and cite relevant references; and unable to communicate adequately in report writing.
3. Group Project	• Ability to work as a team and organise the task; • Ability to conduct literature review; • Ability to understand, interpret, analyse and synthesize the report on a regional ERA; • Ability to use the acquired knowledge to evaluate the pros and cons of the report with critical thinking; • Ability to communicate effectively in oral; • Ability to handle unseen questions.	**High** Able to work as a team and organise the task very well; able to conduct literature review; able to fully understand, interpret, analyse and synthesize the report; able to fully use the acquired knowledge to evaluate the pros and cons of the	**Significant** Able to work as a team and organise the task well; able to conduct literature review; able to understand, interpret, analyse and synthesize the report; able to adequately use the acquired knowledge to evaluate the quality of the report with critical	**Moderate** Able to work as a team and organise the task reasonably well; able to conduct literature review; able to partially understand, interpret, analyse and synthesize the report; able to partially use the acquired knowledge to evaluate the	**Not even reaching marginal levels** Able to work as a team but poorly organise the task; unable to conduct literature review; fail to understand, interpret, analyse and synthesize the report; unable to use the acquired

		report with critical thinking; able to communicate effectively in oral; and handle unseen questions very well.	thinking; able to communicate effectively in oral; and handle unseen questions well.	quality of the report with critical thinking; able to communicate in oral; and handle unseen questions with few errors.	knowledge to evaluate the quality of the report with critical thinking; able to communicate in oral; and handle unseen questions with a few errors.
4. Final Examination	• Ability to understand the subject matter; • Apply to apply the learnt knowledge and computational skills in solving problems; • Ability to communicate effectively in writing.	**High** Able to correctly answer almost all the examination questions precisely and concisely with no errors	**Significant** Able to correctly answer a substantial number of the examination questions precisely and concisely with no errors	**Moderate** Able to correctly answer most of the examination questions precisely and concisely with a few errors	**Not even reaching marginal levels** Unable to correctly answer most of the examination questions

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.)

Risk versus hazard; Environmental risk assessment; Ecological risk assessment; Prospective and retrospective risk assessment; Human health risk assessment; Toxicity tests; Toxicity endpoints; Effect threshold; Ecotoxicology; Predicted no effect concentrations; Assessment factor; Species sensitivity distribution; Analysis of variance; No observable adverse effect level; Acceptable daily intake; Reference dose; Environmental health; Parallel analysis of exposure and effect; Chemical hazards; Chemical regulation; Cancer and non-cancer risks; Food safety; Hazard analysis and critical control points (HACCP); Pollution; Wildlife conservation; Regional Environmental Risk Assessment; Risk characterisation; Risk quotient; Hazard quotient; Monte Carlo simulation; Risk communication.

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.)

U.S. Environmental Protection Agency (1998) Guidelines for Ecological Risk Assessment. Federal Register 63(93):26846-26924. U.S. Environmental Protection Agency, Washington, DC. https://www.epa.gov/sites/production/files/2014-11/documents/eco_risk_assessment1998.pdf

2.2 Additional Readings

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

Amiard-Triquet, Claude, & Rainbow, Philip S. (2009). Environmental Assessment of Estuarine Ecosystems. Baton Rouge: CRC Press.

Calow, P. (1998). Handbook of Environmental Risk Assessment and Management. Oxford; Malden, MA, USA: Blackwell Science.

Crichton, Jonathan, Candlin, Christopher N, & Firkins, Arthur S. (2016). Communicating Risk. London: Palgrave Macmillan UK.

Lerche, Ian, & Glaesser, Walter. (2006). Environmental Risk Assessment: Quantitative measures, anthropogenic influences, human impact. Berlin, Heidelberg: Springer-Verlag.

Lundgren, Regina E, & McMakin, Andrea H. (2018). Risk Communication: A Handbook for Communicating Environmental, Safety, and Health Risks. Newark: John Wiley & Sons, Incorporated.

Paustenbach, D. J. (2002). Human and Ecological Risk Assessment: Theory and Practice. New York: Wiley Interscience.

Ricci, P. (2005). Environmental and Health Risk Assessment and Management. Dordrecht: Springer Netherlands.

Simon, T. (2014). Environmental Risk Assessment: A Toxicological Approach. Baton Rouge: CRC Press.

Suter, G. W., & ebrary, Inc. (2007). Ecological risk assessment (2nd ed.). Boca Raton, Fla.: CRC Press/Taylor & Francis.

More specific references will be given during classes.