CHEM6128: ENVIRONMENTAL HEALTH AND RISK ASSESSMENT

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Environmental Health and Risk Assessment

Subject Code
CHEM - Chemistry
Course Number
6128

Academic Unit
Chemistry (CHEM)

College/School
College of Science (SI)

Course Duration
One Semester

Credit Units
3

Level
P5, P6 - Postgraduate Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
Nil

Exclusive Courses
Nil

Part II Course Details

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.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Gain a sound knowledge of the concepts & principles of Environmental risk assessments (ERAs), and management & communication as applied in practice.	30	x	x	
2	Understand the basic risk assessment tools (i.e. prospective, retrospective and tiered approaches) to environmental risk management.	30	x	x	
3	Be able to select and apply the basic tools to tackle risk issues.	20		x	x
4	Appreciate the interpretations of risk and its role in environmental policy formulation and decision making.	20		x	x

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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	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.	1, 2, 3, 4	
2	Laboratory sessions	Students will work as a team to conduct a standard toxicity test and compute the toxicity endpoint.	3, 4	
3	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.	1, 2, 3, 4	
4	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.	1, 2, 3, 4	

5	Coursework	Students will be engaged in learning through individual assignment, group project and lab report writing.	1, 2, 3, 4	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Individual Assignment: Scientific derivation of predicted no effect concentration of a selected toxic substance.	1, 2	10	
2	Laboratory Report: Reporting the laboratory toxicity test results in a professional manner.	1, 2	25	
3	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).	1, 2, 3, 4	25	

Continuous Assessment (%)

60

Examination (%)

40

Examination Duration (Hours)

2

Additional Information for ATs

Examination:
Students will be assessed via the examination their understanding of concepts learned in class, reading materials and their ability to apply subject related

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."

Assessment Rubrics (AR)

Assessment Task

1. Individual Assignment (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

· Ability to apply the acquired knowledge and computational skills in solving a real-life problem;
· Ability to communicate effectively in writing.

Excellent

(A+, A, A-) High
Able to correctly apply the acquired knowledge and computational skills to solve a real-life problem; and communicate effectively through report writing.

Good

(B+, B, B-) 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.

Fair

(C+, C, C-) 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.

Marginal

(D) 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.

Failure

(F) 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.

Assessment Task

2. Laboratory Report (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

- 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.

Excellent

(A+, A, A-) 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.

Good

(B+, B, B-) 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.

Fair

(C+, C, C-) 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.

Marginal

(D) 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 review and cite relevant references; and able to communicate in report writing.

Failure

(F) 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.

Assessment Task

3. Group Project (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

- 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.

Excellent

(A+, A, A-) 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 well.

Good

(B+, B, B-) 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.

Fair

(C+, C, C-) 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 few errors.

Marginal

(D) 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 questions with some errors.

Failure

(F) 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 questions with a few errors.

Assessment Task

4. Final Examination (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion

· Ability to understand the subject matter;
· Apply to apply the learnt knowledge and computational skills in solving problems;
· Ability to communicate effectively in writing.

Excellent

(A+, A, A-) High
Able to correctly answer almost all the examination questions precisely and concisely with no errors.

Good

(B+, B, B-) Significant
Able to correctly answer a substantial number of the examination questions precisely and concisely with no errors.

Fair

(C+, C, C-) Moderate
Able to correctly answer most of the examination questions precisely and concisely with only a few errors.

Marginal

(D) Basic
Able to correctly answer a few examination questions with some errors.

Failure

(F) Not even reaching marginal levels
Unable to correctly answer most of the examination questions.

Assessment Task

1. Individual Assignment (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

· Ability to apply the acquired knowledge and computational skills in solving a real-life problem;
· Ability to communicate effectively in writing.

Excellent

(A+, A, A-) High
Able to correctly apply the acquired knowledge and computational skills to solve a real-life problem; and communicate effectively through report writing.

Good

(B+, B) 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.

Marginal

(B-, C+, C) 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.

Failure

(F) 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.

Assessment Task

2. Laboratory Report (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

- 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.

Excellent

(A+, A, A-) 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.

Good

(B+, B) 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.

Marginal

(B-, C+, C) 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.

Failure

(F) 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.

Assessment Task

3. Group Project (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

- 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.

Excellent

(A+, A, A-) 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 well.

Good

(B+, B) 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.

Marginal

(B-, C+, C) 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 few errors.

Failure

(F) 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 questions with a few errors.

Assessment Task

4. Final Examination (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion

- Ability to understand the subject matter;
- Apply to apply the learnt knowledge and computational skills in solving problems;
- Ability to communicate effectively in writing.

Excellent

(A+, A, A-) High
Able to correctly answer almost all the examination questions precisely and concisely with no errors

Good

(B+, B) Significant
Able to correctly answer a substantial number of the examination questions precisely and concisely with no errors

Marginal

(B-, C+, C) Moderate
Able to correctly answer most of the examination questions precisely and concisely with a few errors

Failure

(F) Not even reaching marginal levels
Unable to correctly answer most of the examination questions

Part III Other Information

Keyword Syllabus

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.

Reading List

Compulsory Readings

	Title
1	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

Additional Readings

	Title
1	Amiard-Triquet, Claude, & Rainbow, Philip S. (2009). Environmental Assessment of Estuarine Ecosystems. Baton Rouge: CRC Press.
2	Calow, P. (1998). Handbook of Environmental Risk Assessment and Management. Oxford; Malden, MA, USA: Blackwell Science.
3	Crichton, Jonathan, Candlin, Christopher N, & Firkins, Arthur S. (2016). Communicating Risk. London: Palgrave Macmillan UK.
4	Lerche, Ian, & Glaesser, Walter. (2006). Environmental Risk Assessment: Quantitative measures, anthropogenic influences, human impact. Berlin, Heidelberg: Springer-Verlag.
5	Lundgren, Regina E, & McMakin, Andrea H. (2018). Risk Communication: A Handbook for Communicating Environmental, Safety, and Health Risks. Newark: John Wiley & Sons, Incorporated.
6	Paustenbach, D. J. (2002). Human and Ecological Risk Assessment: Theory and Practice. New York: Wiley Interscience.
7	Ricci, P. (2005). Environmental and Health Risk Assessment and Management. Dordrecht: Springer Netherlands.
8	Simon, T. (2014). Environmental Risk Assessment: A Toxicological Approach. Baton Rouge: CRC Press.
9	Suter, G. W., & ebrary, Inc. (2007). Ecological risk assessment (2nd ed.). Boca Raton, Fla.: CRC Press/Taylor & Francis.
10	More specific references will be given during classes.