CHEM3038A: ENVIRONMENTAL SAMPLING AND RISK ASSESSMENT

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Environmental Sampling and Risk Assessment

Subject Code
CHEM - Chemistry
Course Number
3038A

Academic Unit
Chemistry (CHEM)

College/School
College of Science (SI)

Course Duration
One Semester

Credit Units
3

Level
B1, B2, B3, B4 - Bachelor's Degree

Medium of Instruction
English

Medium of Assessment
English

Prerequisites
Nil

Precursors
Nil

Equivalent Courses
BCH3038A Environmental Sampling and Risk Assessment

Exclusive Courses
Nil

Additional Information
Note: CHEM3038A does not contain any practical component, and has a credit unit value of three (3).

Part II Course Details

Abstract

This course aims to:

· introduce students to the principles and techniques in environmental sampling; and risk assessment.
· provide students with an appreciation of the complex relationships of environmental variables and the heterogeneity of environment.
· help students to apply the principles and techniques of experimental and sampling design and data analysis in environmental studies.
· provide experience in application of the principles and techniques in environmental risk assessment.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Identify and articulate the principles in environmental sampling and analysis, and risk assessment, thus acquiring the ability to select the most appropriate approach under different ecological/environmental scenarios.		x	x	
2	Apply sampling and chemical analytical techniques in environmental systems, including aquatic, terrestrial and atmospheric components by conducting relevant field-based studies to explore and discover the applicability and limitations of the said techniques and communicating the findings in laboratory report form.		x	x	x
3	Analyze and interpret environmental data using appropriate statistical techniques and presenting the major findings in a report form and/or oral presentation format, as appropriate.			x	x
4	Undertake human health and ecological risk assessments, and communicate the major findings to environmental managers and other stakeholders.			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.

Teaching and Learning Activities (TLAs)

	TLAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Lectures and tutorials	Teaching and learning activities will be primarily centred around lectures and tutorials in which students will discuss various principles in environmental sampling and analysis, and risk assessment. This will be supplemented with real-world examples.	1	
2	Tutorials, discussion groups, and laboratory practical sessions	During tutorials, discussion groups, and laboratory practical sessions students will design sampling programmes and conduct relevant chemical analyses on field-collected samples and assess the applicability of the designed procedures. The results will be written up by individual students and submitted as reports.	2	
3	Case studies	Students will work on case studies of environmental analysis and will work individually and in groups. They will collate and analyse environmental datasets from government reports or published literature using appropriate statistical techniques.	3	

| 4 | Lectures, tutorials, and small group projects | Students will learn to undertake human health and ecological risk assessments based on data collected and analysed using skills they have acquired during the course through lectures, tutorials, and small group projects during the laboratory practicals. They will be required to present their major findings to other students in the class (who will act as stakeholders). | 4 | |

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Written Assignments	1, 3	40	Continuous Assessment (40%): - Written Assignments - Presentations
2	Presentations	2, 3		

Continuous Assessment (%)

40

Examination (%)

60

Examination Duration (Hours)

3

Additional Information for ATs

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

Written Assignments

Criterion

Completeness and correctness of calculations/answers; adequate application and understanding of literature and class content; logic of argumentation

Excellent (A+, A, A-)

Strong evidence of original thinking; good organization capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base

Good (B+, B, B-)

Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.

Fair (C+, C, C-)

Student who is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material.

Marginal (D)

Sufficient familiarity with the subject matter to enable the student to progress without repeating the course.

Failure (F)

Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant use of literature

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Assessment Task

Presentations

Criterion

Understanding of the topic and material; completeness of the presentation; logic of the presentation structure; clarity of talk; ability to discuss the presented topic

Excellent (A+, A, A-)

Strong evidence of original thinking; good organization capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base

Good (B+, B, B-)

Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.

Fair (C+, C, C-)

Student who is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material.

Marginal (D)

Sufficient familiarity with the subject matter to enable the student to progress without repeating the course.

Failure (F)

Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant use of literature

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Assessment Task

Laboratory Reports

Criterion

Completeness and ability to introduce the research problem/topic and the description of methods used. Appropriate presentation of experimental results and supportive use of scientific literature for discussion

Excellent (A+, A, A-)

Strong evidence of original thinking; good organization capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base

Good (B+, B, B-)

Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.

Fair (C+, C, C-)

Student who is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material.

Marginal (D)

Sufficient familiarity with the subject matter to enable the student to progress without repeating the course.

Failure (F)

Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant use of literature

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Assessment Task

Examination

Criterion

Completeness and correctness of calculations/answers; logic of argumentation and intelligent use of course content/ original thinking

Excellent (A+, A, A-)

Strong evidence of original thinking; good organization capacity to analyse and synthesize; superior grasp of subject matter; evidence of extensive knowledge base

Good (B+, B, B-)

Evidence of grasp of subject, some evidence of critical capacity and analytic ability; reasonable understanding of issues; evidence of familiarity with literature.

Fair (C+, C, C-)

Student who is profiting from the university experience; understanding of the subject; ability to develop solutions to simple problems in the material.

Marginal (D)

Sufficient familiarity with the subject matter to enable the student to progress without repeating the course.

Failure (F)

Little evidence of familiarity with the subject matter; weakness in critical and analytic skills; limited, or irrelevant use of literature

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Part III Other Information

Keyword Syllabus

· Introduction to integrated environmental management systems; cost-benefit considerations; sustainable development.
· Techniques and equipment in environmental sampling and field experiments.
· Collection and analysis of field data, extrapolation and limitation of data.
· Bio-statistics. Experimental and sampling design: controls, random sampling, stratified random sampling, hierarchical sampling, field manipulation. Optimal sample size. Factorial design, Latin square, Power analysis.
· Prospective, retrospective, and comparative risk assessment of environmental contaminants.

- · Hazard identification, dose-response assessment, exposure assessment, and risk characterization.
- · Uncertainty analysis and probabilistic risk assessment.

Reading List

Compulsory Readings

	Title
1	Environmental risk assessment : a toxicological approach, Ted Simon (Boca Raton, FL, CRC Press, 2014)

Additional Readings

	Title
1	Principles of Environmental Sampling, Keith, L.H. (American Chemical Society, Washington D.C., 1998)
2	Risks and Decisions for Conservation and Environmental Management, Burgman, M. (Cambridge University Press, 2005)
3	Handbook of environmental risk assessment and management, edited by Calow, P. (Oxford: Blackwell Science, 1998)
4	Online Resources: To be provided, as required, in lectures and tutorials.