

# CHEM4021: ENVIRONMENTAL POLLUTION

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## Effective Term

Semester A 2022/23

## Part I Course Overview

### Course Title

Environmental Pollution

### Subject Code

CHEM - Chemistry

### Course Number

4021

### Academic Unit

Chemistry (CHEM)

### College/School

College of Science (SI)

### Course Duration

One Semester

### Credit Units

4

### Level

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

### Medium of Instruction

English

### Medium of Assessment

English

### Prerequisites

Nil

### Precursors

CHEM2067/BCH2067 Diversity of Life and Evolution

### Equivalent Courses

BCH4021 Environmental Pollution

### Exclusive Courses

Nil

## Part II Course Details

### Abstract

In this course, students will:

- examine problems caused by air, water, waste and land pollution;
- discuss the effects of pollutants on ecosystems and human health;
- be provided with practical experience in the analysis and interpretation of pollutants in the environment;
- develop knowledge and techniques in the monitoring, assessment and control of air, land and water pollution.

### Course Intended Learning Outcomes (CILOs)

CILOs		Weighting (if DEC-A1 DEC-A2 DEC-A3 app.)			
1	Describe and evaluate the fates and effects of air, water, waste and land-based pollution on ecosystem and human health.				
2	Compare and contrast the various laboratory- and field-based techniques used in pollution monitoring for the assessment and control of air, land and water pollution.				
3	Critically evaluate, using case studies and via group presentations, environmental and socio-economic issues, including soil erosion, farm animal wastes, pesticides, persistent organic contaminants, fertilizers and acid rain.				
4	Critically evaluate, using case studies and group presentations, various methods of chemical and biological monitoring, including the use of soils, dust, micro-organisms, bioindicators, plants, animals and human tissues, in the assessment of rivers, coastal waters, groundwater, surface runoff, leachate and air-borne contaminants.				

#### 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)**

	<b>TLAs</b>	<b>Brief Description</b>	<b>CILO No.</b>	<b>Hours/week (if applicable)</b>
1	Group activities	Teaching and learning will be primarily based around large and small group activities examining various pollutants, emission sources, and contaminant transport and sequestration within environmental compartments.	1	
2	Group activities and practical sessions	Teaching and learning will be based on a combination of large and small group activities laying the basis for common techniques in environmental monitoring, along with complementary practical sessions where students will be able to experience these techniques themselves under guidance.	2	
3	Group activities, written assignments and video presentations	Teaching and learning will be primarily by large and small group activities, written assignments, and complementary video presentations related to particular environmental problems.	3	
4	Group-based assessments	Teaching and learning will be primarily by large and small group activities, and students will be involved in group-based assessments of real world pollution problems which they will present to other members of the class.	4	

**Assessment Tasks / Activities (ATs)**

ATs		CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tutorial Assignments and Quizzes	1, 3, 4	50	Continuous Assessment (50%): - Tutorial Assignments and Quizzes - Group Presentations - Practicals
2	Group Presentations	4		
3	Practicals	2		

**Continuous Assessment (%)**

50

**Examination (%)**

50

**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**

Tutorial Assignments and Quizzes

**Criterion**

understanding of the topic and reading materials; correctness of interpretation and analysis of experimental data

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

**Assessment Task**

Group Presentations

**Criterion**

Understanding of the topic and material; completeness of the presentation; logic of the presentation structure; clarity of talk; appropriate use of photos and figures in the illustration of concepts; ability to discuss the presented topic

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

Practicals

**Criterion**

Correctness of interpretation and analysis of experimental data; understanding of the topic and reading materials; application of knowledge in solving real life problems

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

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**Assessment Task**

Examination

**Criterion**

Completeness and correctness of calculations/answers; correctness of interpretation and analysis of experimental data; application of knowledge in solving real life problems; logic of argumentation and intelligent use of course content/ original thinking

**Excellent (A+, A, A-)**

High

**Good (B+, B, B-)**

Significant

**Fair (C+, C, C-)**

Moderate

**Marginal (D)**

Basic

**Failure (F)**

Not even reaching marginal levels

## Part III Other Information

### Keyword Syllabus

Air Pollution

The structure and properties of the lower atmosphere; air pollution - causes, scales and characteristics; types of atmospheric pollutants. Stationary and mobile sources. Factors important in the removal of atmospheric pollutants. Ozone production in urban air. Acid deposition. Greenhouse effect. Air and water quality: standards, objectives and monitoring. Air pollution in Hong Kong: general features; composition, sources, transformation and removal.

Water Pollution

Water quality parameters, classification of water pollutants. Industrial water pollution. Environmental chemistry of industrial pollutants, particularly in the Hong Kong context.

Sources, Fates, Effects of Pollutants

Environmental pollutants: their emission, transport and fate. Biological and socio-economic effects of major environmental pollutants. Damage to plants, animals and ecosystems. Problems of soil erosion, farm animal wastes, pesticides and excess fertilizers. Features of contaminated, disturbed and derelict land. Sewage and other pollution related to human/urban activity.

Chemical and Biological Monitoring of Pollution

Chemical and biological monitoring. Bioindicators. Uses of soil, dust, microorganisms, plants, animal and human tissues in air monitoring. Establishment of monitoring systems. Sampling and analysis of soil and water. Monitoring of groundwater, surface runoff, leachate and gases from contaminated and disturbed sites.

### Reading List

#### Compulsory Readings

Title	
1	Nil

#### Additional Readings

Title	
1	Connell, D.W., Lam, P.K.S., Richardson, B.J. & Wu, R.S.S. (1999). Introduction to Ecotoxicology. Blackwell Science Ltd., Oxford. 170pp. (Library call number: QH545.A1 I5745 1999).
2	Online Resources: To be provided, as required, in lectures and tutorials.