CHEM4034: ENVIRONMENTAL CONTROL AND WASTE TREATMENT

Effective Term
Semester A 2022/23

Part I Course Overview

Course Title
Environmental Control and Waste Treatment

Subject Code
CHEM - Chemistry
Course Number
4034

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
Nil

Equivalent Courses
BCH4034 Environmental Control and Waste Treatment

Exclusive Courses
CHEM4023/BCH4023 Biological Treatment of Wastes

Part II Course Details

Abstract

In this course, students will:

- develop knowledge in environmental policies and legislations related to air and water pollution control and their economic and social implications and investigate various air and water pollution control strategies and technology.
- develop knowledge in various modern approaches and philosophies in integrated waste management and investigate techniques and methodologies in integrated waste management.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Describe and evaluate various pollution-control strategies and programmes, with special reference to Hong Kong.				
2	Compare and contrast the various strategies to control different types of pollution.				
3	Critically evaluate, using case studies and via group presentations, environmental policies and legislations related to pollution control and their economic and social implications.				
4	Describe and evaluate how different types of wastes are generated, transported and disposed of and their impact on the environment.				
5	Compare and contrast the various strategies in the treatment of wastes.				
6	Critically evaluate, using case studies and via group presentations, appreciate the importance of clean-production and waste-minimization philosophies.				

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	Group activities	Teaching and learning will be primarily based around large and small group activities examining various pollution-control strategies and programmes, with special reference to Hong Kong.	1	
2	Group activities	Teaching and learning will be based on small group activities laying the basis for various strategies to control different types of pollution.	2	
3	Group activities, written assignments and presentations	Teaching and learning will be primarily by large and small group activities, written assignments, and presentations related to environmental policies and legislations related to pollution control and their economic and social implications.	3	
4	Group activities	Teaching and learning will be primarily based around large and small group activities examining how different types of wastes are generated, transported and disposed of and their impact on the environment.	4	
5	Group activities	Teaching and learning will be based on small group activities laying the basis for various strategies in the treatment of wastes.	5	

6	Group activities, written assignments and presentations	Teaching and learning will be primarily by large and small group activities, written assignments and presentations related to the importance of clean-production and waste-minimization philosophies.	6	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Tutorial Assignments & Quizzes	1, 3, 4, 6	40	Continuous Assessment (40%): - Tutorial Assignment & Quizzes - Practicals - Group Presentations
2	Practicals	2, 5		
3	Group Presentations	3, 6		

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

Tutorial Assignments & 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 reachingmarginal levels

Assessment Task
Practicals

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 reachingmarginal levels

Assessment Task
Group Presentations

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 reachingmarginal levels

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 reachingmarginal levels

Part III Other Information

Keyword Syllabus

Environmental Control

- Types and sources of pollution with special reference to Hong Kong and China.
- Environmental policy making in relation to pollution control in Hong Kong, China and overseas.
- Legal aspects of environmental pollution in Hong Kong, China and overseas. Environmental standards and regulations. Pollution Control Ordinances.
- Economic and social implications of environmental protection policies and legislations. The "beneficial use" approach in environmental protection.
- Process chemistry for pollution control.
- Modern control technologies for land, water, air and noise pollution, e.g. adsorption, ion exchange, precipitation, membrane separation technology, electrochemical methods, electrostatic precipitator, control technology for nitrogen oxides and sulphur oxides in flue gas, gas absorption and stripping, use of sound absorbers and barriers, etc.
- Application of microbiology and biotechnology in pollution control.
- Case studies in Hong Kong, China and overseas.

Waste Treatment

- Sources and kinds of wastes. The concept of sustainable development.
- Clean production technology; reduction, reuse, recovery and recycle; end-of-pipe treatment, "Cradle to Grave" approach to waste management.
- Life-cycle analysis; process modification; raw materials and end-product substitutions, waste minimization and separation.
- Chemical, biological and physical remediation of contamination sites. Application of microbiology and biotechnology in waste management.
- Management of toxic and hazardous wastes e.g. chemical, biomedical and nuclear wastes.

- Options in waste disposal and treatment in Hong Kong e.g. landfill, incineration, ocean dumping etc. Socio-economic considerations.
- Selected studies/examples in Hong Kong, China and overseas.

Reading List

Compulsory Readings

	Title
1	Nil

Additional Readings

	Title
1	To be provided, as required, in lectures and tutorials.