CHEM4034: ENVIRONMENTAL CONTROL AND WASTE TREATMENT

Effective Term
Semester A 2024/25

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, and compare and contrast the various strategies to control different types of pollution.				
2	Critically evaluate, using case studies and via group presentations, environmental policies and legislations related to pollution control and their economic and social implications.				
3	Describe and evaluate how different types of wastes are generated, transported and disposed of and their impact on the environment.				
4	Compare and contrast the various strategies in the treatment of wastes.				
5	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.

Learning and Teaching Activities (LTAs)

	LTAs	Brief Description	CILO No.	Hours/week (if applicable)
1	Group activities	Through large and small group activities, students will examine various pollution-control strategies and programmes, with special reference to Hong Kong.	1	

2	Group activities	Through small group activities, students will learn about various strategies to control different types of pollution.	1	
3	Group activities, written assignments and presentations	Through large and small group activities, students will prepare written assignments, and deliver presentations related to environmental policies and legislations related to pollution control and their economic and social implications.	2	
4	Group activities	Through large and small group activities, students will examine how different types of wastes are generated, transported and disposed of and their impact on the environment.	3	
5	Group activities	Through small group activities, students will understand various strategies in the treatment of wastes.	4	
6	Group activities, written assignments and presentations	Through large and small group activities, students will prepare written assignments and deliver presentations related to the importance of clean-production and waste-minimization philosophies.	5	

Assessment Tasks / Activities (ATs)

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

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-)

Demonstrates a comprehensive understanding of the topic and reading materials, with highly accurate interpretation and analysis of experimental data.

Good (B+, B, B-)

Shows a significant understanding of the topic and reading materials, with mostly accurate interpretation and analysis of experimental data.

Fair (C+, C, C-)

Displays a moderate understanding of the topic and reading materials, with some accurate interpretation and analysis of experimental data.

Marginal (D)

Exhibits a basic understanding of the topic and reading materials, with limited accuracy in interpretation and analysis of experimental data.

Failure (F)

Does not demonstrate even a marginal understanding of the topic and reading materials, with highly inaccurate interpretation and analysis of experimental data.

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-)

Demonstrates a comprehensive understanding of the topic and material, with a complete and logically structured presentation, clear talk, and excellent use of photos and figures to illustrate concepts, and strong discussion ability.

Good (B+, B, B-)

Shows a significant understanding of the topic and material, with a mostly complete and logically structured presentation, clear talk, and good use of photos and figures to illustrate concepts, and good discussion ability.

Fair (C+, C, C-)

Displays a moderate understanding of the topic and material, with a somewhat complete and logically structured presentation, clear talk, and adequate use of photos and figures to illustrate concepts, and moderate discussion ability.

Marginal (D)

Exhibits a basic understanding of the topic and material, with an incomplete and poorly structured presentation, unclear talk, and limited use of photos and figures to illustrate concepts, and limited discussion ability.

Failure (F)

Does not demonstrate even a marginal understanding of the topic and material, with a highly incomplete and illogically structured presentation, unclear talk, and poor use of photos and figures to illustrate concepts, and poor discussion ability.

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-)

Demonstrates a comprehensive understanding of the topic and reading materials, with highly accurate interpretation and analysis of experimental data, and excellent application of knowledge in solving real-life problems.

Good (B+, B, B-)

Shows a significant understanding of the topic and reading materials, with mostly accurate interpretation and analysis of experimental data, and good application of knowledge in solving real-life problems.

Fair (C+, C, C-)

Displays a moderate understanding of the topic and reading materials, with some accurate interpretation and analysis of experimental data, and adequate application of knowledge in solving real-life problems.

Marginal (D)

Exhibits a basic understanding of the topic and reading materials, with limited accuracy in interpretation and analysis of experimental data, and limited application of knowledge in solving real-life problems.

Failure (F)

Does not demonstrate even a marginal understanding of the topic and reading materials, with highly inaccurate interpretation and analysis of experimental data, and poor application of knowledge in solving real-life problems.

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-)

Provides complete and correct calculations/answers, with highly accurate interpretation and analysis of experimental data, excellent application of knowledge in solving real-life problems, and logical argumentation with intelligent use of course content/original thinking.

Good (B+, B, B-)

Provides mostly complete and correct calculations/answers, with mostly accurate interpretation and analysis of experimental data, good application of knowledge in solving real-life problems, and logical argumentation with good use of course content/original thinking.

Fair (C+, C, C-)

Provides somewhat complete and correct calculations/answers, with some accurate interpretation and analysis of experimental data, adequate application of knowledge in solving real-life problems, and logical argumentation with adequate use of course content/original thinking.

Marginal (D)

Provides incomplete and incorrect calculations/answers, with limited accuracy in interpretation and analysis of experimental data, limited application of knowledge in solving real-life problems, and poor argumentation with limited use of course content/original thinking.

Failure (F)

Does not provide even marginally complete and correct calculations/answers, with highly inaccurate interpretation and analysis of experimental data, poor application of knowledge in solving real-life problems, and illogical argumentation with poor use of course content/original thinking.

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.