SEE6214: SOLID WASTE TREATMENT AND MANAGEMENT

Effective Term
Semester B 2024/25

Part I Course Overview

Course Title
Solid Waste Treatment and Management

Subject Code
SEE - School of Energy and Environment
Course Number
6214

Academic Unit
School of Energy and Environment (E2)

College/School
School of Energy and Environment (E2)

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

This course aims to provide students with up-to-date knowledge on topics relating to waste management and processing. It details the current methods of managing solid waste and discusses technologies include waste collection, transfer, recycling, waste-to-energy, bio-energy, incineration, hazardous waste management and landfill disposal. Specific waste valorisation techniques for various industrial waste streams, and a comparison of existing chemical/thermal techniques with bio-based, green chemistry processes and/or novel-assisted techniques will be provided. Students will learn to design an integrated waste management system for source reduction and disposal by combining the available options. Sustainable development and life-cycle assessment will be discussed in relationship to waste management.

Course Intended Learning Outcomes (CILOs)

	CILOs	Weighting (if app.)	DEC-A1	DEC-A2	DEC-A3
1	Explain existing methods to manage and process solid waste	20		x	
2	Analyse physical, chemical, and biological properties of solid waste and evaluate available biological and thermal treatment technologies	25		x	
3	Describe and analyse recycling and waste-to-energy technologies and other sustainable developments	20	x		
4	Apply life cycle analysis to design integrated solid waste management and treatment system	20			x
5	Identify the challenges in waste valorisation by applying appropriate techniques for treatment of various waste streams	15		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	Lecture	Explain the key concepts of solid and hazardous waste management, treatment technologies	1, 2, 3, 4	
2	Tutorial, case study, in-class exercises	Introduction of latest incineration, energy recovery, solid waste recycling and technologies	1, 2, 3, 4	

Assessment Tasks / Activities (ATs)

	ATs	CILO No.	Weighting (%)	Remarks (e.g. Parameter for GenAI use)
1	Assignment	1, 2, 3	20	
2	Project Presentation	1, 2, 3, 4, 5	10	
3	Mid-term test	2, 3, 4	30	

Continuous Assessment (%)

60

Examination (%)

40

Examination Duration (Hours)

2

Additional Information for ATs

To pass a course, a student must do ALL of the following:
1) obtain at least 30% of the total marks allocated towards coursework (combination of assignments, pop quizzes, term paper, lab reports and/ or quiz, if applicable);
2) obtain at least 30% of the total marks allocated towards final examination (if applicable); and
3) meet the criteria listed in the section on Assessment Rubrics.

Assessment Rubrics (AR)

Assessment Task

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

Criterion

Ability to evaluate and analyze waste management technologies

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

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

Criterion

Ability to design sustainable solutions to the problem of MSW management

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

Criterion
Ability to provide engineering solutions to integrated waste treatment and management system

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
Mid-term test (for students admitted before Semester A 2022/23 and in Semester A 2024/25 & thereafter)

Criterion
Ability to provide engineering solutions to integrated waste treatment and management system

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

Criterion
Ability to evaluate and analyze waste management technologies

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Moderate to Basic

Failure
(F) Not even reaching marginal levels

Assessment Task
Project Presentation (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Ability to design sustainable solutions to the problem of MSW management

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Moderate to Basic

Failure
(F) Not even reaching marginal levels

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

Criterion
Ability to provide engineering solutions to integrated waste treatment and management system

Excellent
(A+, A, A-) High

Good
(B+, B) Significant

Marginal
(B-, C+, C) Moderate to Basic

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Assessment Task
Mid-term test (for students admitted from Semester A 2022/23 to Summer Term 2024)

Criterion
Ability to provide engineering solutions to integrated waste treatment and management system

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(F) Not even reaching marginal levels

Part III Other Information

Keyword Syllabus

- Municipal, industrial and construction solid waste treatment
- Principles of waste collection and treatment process and design
- Sludge disposal, landfill and related pollution problems
- Technologies associated with hazardous waste treatment
- Waste to energy technologies – bio-energy, incineration, etc.
- Recycling – metal, plastic, glass, etc.
- Sustainable development and waste management (source control, sorting, policy, charging scheme, etc.)
- Green and sustainable chemistry in waste valorisation, waste-based biorefinery and circular economy

Reading List

Compulsory Readings

	Title
1	WORRELL W.A. and VESILIND P.A. (2012) Solid Waste Engineering, 2nd ed. Connecticut: Cengage Learning.
2	Municipal Solid Waste Management in Developing Countries developed by École Polytechnique Fédérale de Lausanne in Coursera https://www.coursera.org/learn/solid-waste-management/

Additional Readings

	Title
1	CHRISTENSEN, T. (ed.) (2010) Solid Waste Technology & Management. New Jersey: John Wiley & Sons, Ltd.
2	http://www.epd.gov.hk/epd/english/environmentinhk/waste/waste_maincontent.html

3	Hong Kong BLUEPRINT FOR SUSTAINABLE USE OF RESOURCES 2013 – 2022 http://www.enb.gov.hk/en/files/WastePlan-E.pdf
4	Kosseva, M.R., Webb, C. (2020) Food Industry Wastes: Assessment and Recuperation of Commodities 2nd Edition, Academic Press. San Diego, USA. https://www.sciencedirect.com/book/9780128171219/food-industry-wastes%23book-info