



Course Syllabus (Academic Year 2021)

School of Interdisciplinary Studies, Kanchanaburi Campus, Mahidol University

1. **Course No. and Title** : KAED 352 Hazardous Waste Management
Credit (study hours) : 3 (3-0-6)
2. **Program Name** : Bachelor of Engineering Program in Environmental Engineering and Disaster Management
3. **Course Module** : Major Required Courses
Pre/co-requisite : KAED 225 (Solid Waste Engineering)
4. **Class Semester** : 1st Semester 2nd Semester Academic Year 2021
5. **Class Schedule & Venue** : Monday 13:00 – 16:00
6. **Class Coordinator** : Dr. Pensiri Prachakittikul Contact No: 086-024-0919
 Email: pensiri.prc@mahidol.edu

7. Course Description

Definition, laws and environmental legislations, classification of hazardous wastes, physicochemical properties, toxicology, types and characteristics of hazardous waste, risk assessment and management, handling and transportation, fundamentals of treatment and disposal processes, stabilization, solidification, land disposal, site remediation.

8. Course Objectives / Course Learning Outcomes (CLOs)

No.	Objectives / CLOs	Expected Skills / Knowledge			PLOs
		Specific	Generic	Knowledge	
8.1	Explain the definitions of hazardous waste, characteristics (types, sources, composition) and properties of hazardous wastes	1	1, 3, 4, 5	1, 2	1, 2, 6
8.2	Identify regulations for the handling, storage, and use of hazardous materials and industrial waste	1-3	1, 2, 3, 4, 6, 7	1, 2	1, 2, 6
8.3	Explain the basic concept of hazardous substance toxicology	4	1, 3, 4	3	1, 2, 6

No.	Objectives / CLOs	Expected Skills / Knowledge			PLOs
		Specific	Generic	Knowledge	
8.4	Explain the pathways for transport of hazardous waste in various environments	1	1, 3, 4, 6, 10	1, 4	1, 2, 6
8.5	Explain the techniques of hazardous waste management, treatment, minimization, and site remediation	2-3	1, 3, 4, 5, 6, 7, 10	1-4	1, 2, 6

9. Class Instructor List

9.1 Dr. Pensiri Prachakittikul (PP) Contact No.: 086-024-0919 Email: pensiri.prc@mahidol.edu

10. Course Outline

Week	Date	Contents	CLOs	Teaching & Learning Method	Instructor's Names
1	10/01/2022	<ul style="list-style-type: none"> Course introduction Ch1: Overview Hazardous Waste Management 	1, 3	Lecture (ppt and social media platform) Ask and answer Group discussion	Dr. Pensiri
2	17/01/2022	<ul style="list-style-type: none"> Ch2: Toxic waste and industrial hazardous waste I 	1, 3	Lecture (ppt) Ask and answer	
3	24/01/2022	<ul style="list-style-type: none"> Ch2: Toxic waste and industrial hazardous waste II Ch3: Properties of Hazardous waste 	1, 3	Lecture (ppt) Problem practice Ask and answer	
4	31/01/2022	<ul style="list-style-type: none"> Ch3: Properties of Hazardous waste (Cont.) 	1, 3	Lecture (ppt) Problem practice Ask and answer	
5	7/02/2022	<ul style="list-style-type: none"> Review Ch. 1-3 Ch4: Industrial waste hazardous waste generators and regulatory requirements 	1, 3	Lecture (ppt and social media platform) Ask and answer	
6	14/02/2022	<ul style="list-style-type: none"> Ch5: Industrial waste hazardous waste storage and Transportation 	1, 3, 4	Lecture (ppt and social media platform) Ask and answer Problem practice	

Week	Date	Contents	CLOs	Teaching & Learning Method	Instructor's Names
7	21/02/2022	<ul style="list-style-type: none"> Ch5: Industrial waste hazardous waste storage and Transportation (Cont.) Ch6: Hazardous substance toxicology 	2	Lecture (ppt and social media platform) Ask and answer Problem practice	
28/02/2022 Mid-term Examination					
8	7/03/2022	<ul style="list-style-type: none"> Ch7: Pathways, fate, and transport of hazardous Waste 	2	Lecture (ppt) problem practice Ask and answer	Dr. Pensiri
9	14/03/2022	<ul style="list-style-type: none"> Ch7: Pathways, fate, and transport of hazardous waste (contaminants in the water) 	2	Lecture (ppt) problem practice Ask and answer	
10	21/03/2022	<ul style="list-style-type: none"> Ch8: Hazardous waste management (Pollution prevention, waste minimization, reuse, and recycling) Ch8: Facility Development and Operations 	1, 3, 4	Self-learning and Group discussion Lecture (ppt) problem practice Ask and answer	
11	28/03/2022	<ul style="list-style-type: none"> Review Ch. 7-8 Ch9: Stabilization and solidification) 	1, 3, 4	Lecture (ppt) Ask and answer	
12	4/04/2022	<ul style="list-style-type: none"> Ch10: Treatment and disposal methods (Physico - chemical processes: stripping, soil vapor extraction etc.) 	1, 3, 4	Lecture (ppt) Ask and answer problem practice	
13	11/04/2022	<ul style="list-style-type: none"> Ch10: Treatment and disposal methods (Physico - chemical processes: adsorption, oxidation-reduction, advanced oxidation process) 	1, 3, 4	Lecture (ppt) Ask and answer problem practice	
14	18/04/2022	<ul style="list-style-type: none"> Ch10: Treatment and disposal methods (Thermal treatment: incineration, pyrolysis) 	1, 3, 4	Lecture (ppt) Ask and answer	
15	25/04/2022	<ul style="list-style-type: none"> Ch10: Treatment and disposal methods (land disposal, Site Remediation) Group presentation 	1, 3, 4	Lecture (ppt) Ask and answer	

Week	Date	Contents	CLOs	Teaching & Learning Method	Instructor's Names
				Student-centered (Presentation and Discussion)	
2/05/2022 Final Examination					

11. Course Assessment

No.	Methods / Activities	Regulations	CLOs	Week	Weight Distribution (%)
11.1	Mid-term exam	- Contents (week 1-7) - Closed book	8.1, 8.2	9	35
11.2	Final exam	- Contents (week 9-15) - Closed book	8.1-8.4	19	35
11.3	Quiz	- Pretest or posttest - Closed book	8.1-8.4	TBA	10
11.4	Assignments/Homework	Homework must be turned in during the class hour in the classroom on the due date.	8.1-8.4	TBA	5
11.5	Group Presentation	TBA	8.1-8.4	16	10
11.6	Class participation	Learners must attend class more than 80% of the course. Learners must be engaged in asking - answering questions and discussions.	8.1-8.4	All	5
				Total	100

12. Grading System

Criterion-referenced evaluation

Grade	Score	Grade	Score	Grade	Score	Grade	Score
A	≥ 80 %	B	70 – 74.99%	C	60 – 64.99%	D	50 – 54.99%
B+	75 – 79.99%	C+	65 – 69.99%	D+	55 – 59.99%	F	< 50 %

Norm-referenced evaluation

*If use both criterion and norm-referenced evaluation, please tick two boxes.

13. References

13.1 เกียรติศักดิ์ อุดมสินโรจน์, ของเสียอันตราย, พิมพ์ครั้งที่ ๑. มหาวิทยาลัยรังสิต, กรุงเทพมหานคร. ๒๕๕๓.

13.2 Michael D. LaGrega, Phillip L. Buckingham, Jeffrey C. Evans: Hazardous Waste Management McGraw-Hill, Inc., Singapore, International Editions, 1994

13.3 Richard J. Watts, Hazardous Wastes: Sources, Pathways, Receptors, John Wiley & Sons, Inc., New York; January 1998, ISBN: 0-471-00238-0.

Note

Specific Skill (SS)	
SS1	Assess quantity and quality of hazardous wastes
SS2	Specify important criteria for suitable and reliable of hazardous waste management
SS3	Identify and safely handle hazardous chemicals
SS4	Evaluate the toxicity of a substance for the purpose of health risk assessment
Generic Skill (GS)	
GS1	Systematic Thinking, Problem Solving and Analytical Skills
GS2	Basic Computer Skills
GS3	Environmental and Disaster Risk Awareness
GS4	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
GS5	A knowledge of contemporary issues
GS6	Formal and informal communication
GS7	The broad education necessary to understand the impact of engineering solutions in a global,
GS10	economic, environmental, and societal context
GS11	A recognition of the need for, and an ability to engage in life-long learning
Knowledge (K)	
K1	Sources and classification hazardous wastes
K2	Regulations of hazardous waste management
K3	Risk identification method
K4	Environmental unit operation for hazardous waste management
PLOs	
PLO1	Apply environmental engineering principles and knowledge to systematic solutions according to professional standards
PLO2	Apply practical skills in environmental engineering and disaster management to real situations based on academic principles and professional ethics
PLO6	Develop a creative technology in environmental engineering and disaster management