



Course Syllabus (Academic Year 2021)

School of Interdisciplinary Studies, Kanchanaburi Campus, Mahidol University

1. **Course No. and Title** : KAED 226 Water and Wastewater Laboratory
Credit (study hours) : 1(0-3-6)
2. **Program Name** : Bachelor of Engineering Program in Environmental Engineering and Disaster Management
3. **Course Module** : Major Required Courses
Pre/co-requisite : SCCH 113 (General Chemistry) (pre-requisite)
 : KAED 225 (Chemistry for Environmental Engineering) (co-requisite)
4. **Class Semester** : 1st Semester 2nd Semester Academic Year 2021
5. **Class Schedule & Venue** : **Tuesday and Wednesday: 9:00 – 12:00**, Room L305/L306
Google classroom:
<https://classroom.google.com/c/MzO3NTkxMzlyMzI0?cjc=fx2x3c5>
6. **Class Coordinator** : Dr. Pensiri Prachakittikul
 Contact No: 086-024-0919
 : Email: pensiri.prc@mahidol.edu

7. Course Description

Basic concepts of analytical chemistry, sample collections and preservations, expression of chemical analyses results, precision and accuracy of analyses, laboratory techniques, water and wastewater analyses in laboratory e.g. pH, hardness, alkalinity, acidity, solids, dissolved oxygen, biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrogen, phosphorus, etc. Technic for general microbiological analysis, e.g. sterile techniques, microscopic observation, dye staining, determination of coliform bacteria, etc. Data interpretation and application of data to environmental engineering practice e.g. wastewater treatment system and neutralization

8. Course Objectives / Course Learning Outcomes (CLOs)

No.	Objectives / CLOs	Expected Skills / Knowledge			PLOs
		Specific (SS)	Generic (GS)	Knowledge (K)	
8.1	Identify laboratory equipment used in the basic analysis of water and wastewater	SS1-SS3	GS1, GS3	K1-K6	2

No.	Objectives / CLOs	Expected Skills / Knowledge			PLOs
		Specific (SS)	Generic (GS)	Knowledge (K)	
8.2	Define terminology used for basic chemical, physical, and bacteriological examination of water and wastewater	SS1-SS2	GS1, GS3, GS4, GS5	K1-K6	1, 4
8.3	Perform mathematical calculations required for basic laboratory analysis of water and wastewater	SS1-SS4	GS1-GS3	K1-K6	2
8.4	Perform and/or explain basic chemical, physical, and bacteriological laboratory analysis of water and wastewater	SS1-SS4	GS1-GS5	K1-K6	2, 4
8.5	Write a laboratory summary of experiments performed	SS1-SS5	GS1-GS5	K1-K6	4

9. Class Instructor List

- 9.1 Dr. Pensiri Prachakittikul (PP) Contact No.: 086-024-0919 Email: pensiri.prc@mahidol.edu
- 9.2 Dr. Chetsada Phaenark (CP) Contact No.: 080-076-2169 Email: chetsada.pha@mahidol.ac.th
- 9.3 Asst. Prof. Dr. Waraporn Threeprom (WT) Contact No.: 083-778-4445 Email: waraporn.the@mahidol.ac.th

Scientist List

- Ms. Kannika Pasada (KP) Contact No.: 083-829-9956 Email: kannika.pas@mahidol.ac.th
- Miss Phirata Khunode (PK) Contact No.: 089-248-0181 Email: phirata.khu@mahidol.ac.th
- Mr Suphat Prasopsin (SP) Contact No.: 087-151-2945 Email: suphat.pra@mahidol.ac.th
- Mr. Thanaphat Klubchum (TK) Contact No. Email: thanaphat.klu@mahidol.ac.th
- Mr. Phong Srithongdee (PS) Contact No.: 063-165-9657 Email: phong.srt@mahidol.ac.th

10. Course Outline

Week	Date	Contents	CLOs	Teaching & Learning	Groups	Instructor's Names
1	Wed 1/09/2021	- Fundamental of quantitative and qualitative analysis - Error, accuracy, and precision - Standard solution preparation - Spectroscopy - Beer's law	1-2	Lecture	All groups	WT
2	Tue 7/09/2021-	- Lab safety - Introduction to water quality instruments and measurements	1-2	Lecture	G.1-G.4	PK, PP
		L.1: Water sampling and analysis (Color, Turbidity, pH, Conductivity) Methods for sampling, preserving, and analyzing samples			G.5-G.8	SP, TK, PS, PP
3	Wed 8/09/2021	- Lab safety - Introduction to water quality instruments and measurements	1-2	Lecture	G.5-G.8	PK, PP
		L.1: Water sampling and analysis (Color, Turbidity, pH, Conductivity) Methods for sampling, preserving, and analyzing samples			G.1-G.4	SP, TK, PS, PP
4	Tue 14- Wed 15/09/2021	L.2: Acidity, L.3: Alkalinity, L.4: Hardness		Lab practice/ Discussion/ Lab report	G.1, G.2	CP
		L.6: Solid, L.7: Phosphorus			G.3, G.4	PP, PK
		L.5: Nitrogen			G.5, G.6	WT
		L.8: Chloride			G.7, G.8	PP
5	Tue 21- Wed 22/09/2021	L.2: Acidity, L.3: Alkalinity, L.4: Hardness			G.7, G.8	CP
		L.6: Solid, L.7: Phosphorus			G.1, G.2	PP, PK
		L.5: Nitrogen			G.3, G.4	WT
		L.8: Chloride			G.5, G.6	PP
6	Tue 28- Wed 29/09/2021	L.2: Acidity, L.3: Alkalinity, L.4: Hardness			G.5, G.6	CP
		L.6: Solid, L.7: Phosphorus			G.7, G.8	PP, PK
		L.5: Nitrogen			G.1, G.2	WT
		L.8: Chloride			G.3, G.4	PP
7	Tue 5-Wed 6/10/2021	L.2: Acidity, L.3: Alkalinity, L.4: Hardness			G.3, G.4	CP
		L.6: Solid, L.7: Phosphorus			G.5, G.6	PP, PK

		L.5: Nitrogen			G.7, G.8	WT	
		L.8: Chloride			G.1, G.2	PP	
8	Tue 20/10/2021 Mid-term Examination (Lab Practical Exam)					PP, PK, SP, PS	
9	Tue 26- Wed 27/10/2021	L.9: Sulfide, L.10: VFA		Lab practice/ Discussion/ Lab report	G.1, G.2	PP	
		L.12: COD, L.13: FOG			G.3, G.4	CP	
		L.11: Iron			G.5, G.6	WT	
		L.14: DO and BOD			G.7, G.8	PP, PK	
10	Tue 2-Wed 3/11/2021	L.9: Sulfide, L.10: VFA			G.7, G.8	PP	
		L.12: COD, L.13: FOG			G.1, G.2	CP	
		L.11: Iron			G.3, G.4	WT	
		L.14: DO and BOD			G.5, G.6	PP, PK	
11	Tue 9-Wed 10/11/2021	L.9: Sulfide, L.10: VFA			G.5, G.6	PP	
		L.12: COD, L.13: FOG			G.7, G.8	CP	
		L.11: Iron			G.1, G.2	WT	
		L.14: DO and BOD			G.3, G.4	PP, PK	
12	Tue 16- Wed 17/11/2021	L.9: Sulfide, L.10: VFA			G.3, G.4	PP	
		L.12: COD, L.13: FOG			G.5, G.6	CP	
		L.11: Iron			G.7, G.8	WT	
		L.14: DO and BOD			G.1, G.2	PP, PK	
13-14	Tue 23- Wed 24/11/2021	L.15: Coliform bacteria determination			All groups	CP, KP	
15	Wed 1/12/2021 Final Examination (Lab Practical Exam): To be announced					PP, PK, SP, KP,	
16						PS	

11. Course Assessment

No.	Methods / Activities	Regulations	CLOs	Week	Weight Distribution (%)
11.1	Mid-term exam	- Content week 1-7 - Faculty-approved calculator	8.1, 8.2	1-7	35
11.2	Final exam	- Content week 9-14 - Faculty-approved calculator	8.1-8.4	9-14	25
11.3	Laboratory reports	Send the lab report on time/ Lab report quality	8.1-8.4	2, 4-7, 9-14	35
11.4	Class participation	Student must attend class 100 % of course	8.1-8.4	1-8, 10-16	5
				Total	100

12. Grading System

Criterion-referenced evaluation

Grade	Score	Grade	Score	Grade	Score	Grade	Score
A	$\geq 80\%$	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	$< 50\%$

13. References

13.1 สาขาวิชาวิศวกรรมสิ่งแวดล้อมและการจัดการภัยพิบัติ, คู่มือปฏิบัติการวิเคราะห์น้ำและน้ำเสีย, มหาวิทยาลัยมหิดล วิทยาเขตกาญจนบุรี, 2563

13.2 APHA, AWWA, WPCF. Standard methods for the examination of water and wastewater. 21st edition, American Public Health Association, Washington, DC, USA. 2005

Note:

PLO	
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
PLO4	Effectively present and discuss engineering knowledge to relate professional people for objective fulfillment by using proper language and media
Specific Skill (SS)	
SS1	Laboratory skills
SS2	Commonly measured wastewater parameters
SS3	Analysis of water and wastewater parameters and interpretation of experimental results
SS4	Preparation of laboratory reports
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
Knowledge (K)	
K1	Analytical chemistry
K2	Basic chemistry of water and wastewater and Analysis
K3	Physical, chemical, and biological water and wastewater characteristics
K4	Water Quality
K5	Standards of Effluents
K6	Sampling and preservation of water and wastewater methods