Course Syllabus (Academic Year 2022)

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 2022
5. **Class Schedule & Venue** : **Wednesday: 9:00 – 12:00**, Room L-306
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 Learning Outcomes (CLOs)**

No.	CLOs	Expected Skills / Knowledge			PLOs
		Specific (SS)	Generic (GS)	Knowledge (K)	
1	Conduct laboratory analysis to analyze the chemical characteristics of water and wastewater according to the standard methods prescribed	SS1-SS2 -Laboratory work - Experimentation -Data interpretation	GS1 -Self-Discipline	K1-K6	2 (Practical)

No.	CLOs	Expected Skills / Knowledge			PLOs
		Specific (SS)	Generic (GS)	Knowledge (K)	
2	Perform necessary mathematical calculations required in water and wastewater laboratory testing	SS3-SS4 - Mathematic solving	GS1	- Sciences and Mathematics	1 (Practical)
3	Demonstrate the ability to analyze the results of such experiments.	SS3-SS4 -Experimentation -Data interpretation -Laboratory work	GS1, GS3, GS4, GS5 -Professional ethics and Responsibility	K3, K5	2 (Practical)
4	Write the clearly and concisely reports on the experimental methodologies and results of the lab-based experiments	SS3-SS4 Engineering terminology	GS1-GS5 -Communication -Writing skills	K1-K6 -Language -MS Office program tools	4 (Introductory)
5	Demonstrate the ability to interact, collaborate, listen, assist, communicate orally and in writing and share responsibilities with lab partners	-	GS6 -Interpersonal skill -Lifelong-learning -Teamwork	-	5 (Introductory)

9. Class Instructor List

9.1 Asst. Prof. Dr. Waraporn Threeprom (WT) Contact No.: 083-778-4445 Email: waraporn.the@mahidol.ac.th

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

9.3 Dr. Wimonmas Boonyungyuen (WB) Contact No.: 081-906-6678 Email: bwimonmas@yahoo.com

9.4 Dr. Chetsada Phaenark (CP) Contact No.: 080-076-2169 Email: chetsada.pha@mahidol.ac.th

Scientist List

1. Ms. Kannika Pasada (KP) Contact No.: 083-829-9956 Email: kannika.pas@mahidol.ac.th
2. Miss Phirata Khunode (PK) Contact No.: 089-248-0181 Email: phirata.khu@mahidol.ac.th
3. Mr Suphat Prasopsin (SP) Contact No.: 087-151-2945 Email: suphat.pra@mahidol.ac.th
4. Mr. Thanaphat Klubchum (TK) Contact No. Email: thanaphat.klu@mahidol.ac.th
5. 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	10/08/2022	- Fundamental of quantitative and qualitative analysis - Error, accuracy, and precision - Standard solution preparation - Spectroscopy - Beer's law	2, 3	Lecture	All groups	WT
2	17/08/2022	- Lab safety - Introduction to water quality instruments and measurements Methods for sampling, preserving, and analyzing samples	1-2	Lecture/ quiz/ Asking and answering	All groups	PP, PK, SP, PS
3	24/08/2022	- L.1: water sampling and analysis (Color, Turbidity, pH, Conductivity)	1-5	Lecture/ Lab practice/ Asking and answering /write report	All groups	PP, TK, SP, PS
4	31/08/2022	L.2: Acidity, L.3: Alkalinity, L.4: Hardness			G.1, G.2	CP
		L.5: Nitrogen			G.3, G.4	WT
5	7/09/2022	L.2: Acidity, L.3: Alkalinity, L.4: Hardness			G.3, G.4	CP
		L.5: Nitrogen			G.1, G.2	WT
6	14/09/2022	L.6: Solid, L.7: Phosphorus			G.1, G.2	WB
		L.8: Chloride			G.3, G.4	PP
7	21/09/2022	L.6: Solid, L.7: Phosphorus			G.3, G.4	WB
		L.8: Chloride			G.1, G.2	PP
8	28/09/2022	Lab Practical Exam	1, 2	exam	All groups	PP, PK, SP, PS
9	**5/10/2022 Written Midterm Examination**					
10	12/10/2022	L.9: Sulfide, L.10: VFA	1-5	Lecture/ Lab practice/ Asking and answering /write report	G.1, G.2	PP
		L.11: Iron			G.3, G.4	WT
11	19/10/2022	L.9: Sulfide, L.10: VFA			G.3, G.4	PP
		L.11: Iron			G.1, G.2	WT
12	26/10/2022	L.15: Coliform			All groups	CP, KP
13	2/11/2022	L.12: COD, L.13: FOG			G.1, G.2	PP
		L.14: DO and BOD			G.3, G.4	WB
14	9/11/2022	L.15: Coliform			All groups	CP, KP
15	16/11/2022	L.12: COD, L.13: FOG			G.3, G.4	PP
		L.14: DO and BOD			G.1, G.2	WB
16	23/11/2022	Wrap up	3, 4	Discussion/ Asking and answering	All groups	PP

17	30/11/2022	Lab Practical Exam	1, 2	exam	All groups	PP, PK, SP, PS
18	**7/12/2022 Written Final Examination**					

11. Course Assessment

No.	Methods / Activities	Regulations	CLOs	Week	Weight Distribution (%)
1	Lab Practical Exam	- All laboratory experiments are to be included for practical examination - Students are allowed to pick two experiments from the lot.	1, 2	8, 16	30
2	Written midterm exam (Theory Exam)	- Content week 1-7 - Faculty-approved calculator	2, 3	9	15
3	Written final exam	- Content week 9-14 - Faculty-approved calculator	2, 3	18	15
4	Laboratory reports	Laboratory report rubric	2, 3, 4, 5	2, 4-7, 9-14	30
5	Active Participation, Class Attendance	Class collaboration rubric	5	1-7, 10-15	10
				Total	**100**

Groups reports

- Reports on experiments will be due ONE WEEK after the experiment is completed.
- Reports submitted after 9.00 on will be counted as one day late. Late reports are accepted for only 2 days and will be penalized 5 % per day. No report after that day will be accepted at all.

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 %

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
PLO5	Work as an environmental engineer with other people to solve complicated problems according to economic, social, and environmental issues
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
GS6	Develop laboratory skills, critical thinking, and communication skills
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