Tamkang University Academic Year 114, 1st Semester Course Syllabus

Course Title	SPECIAL TOPIC ON ENVIRONMENTAL UNIT OPERATION	Instructor	YA VINH
Course Class	TEWXD1A DOCTORAL PROGRAM, DEPARTMENT OF WATER RESOURCES AND ENVIRONMENTAL ENGINEERING, 1A	Details	◆ General Course ◆ Selective ◆ One Semester ◆ 3 Credits
Relevance to SDGs	SDG6 Clean water and sanitation SDG9 Industry, Innovation, and Infrastructure SDG13 Climate action		

Departmental Aim of Education

Ⅰ. Cultivating students with capabilities of carrying out practical works or academic research related to water resources and environmental engineering.

Ⅱ. Cultivating students with capability of solving problems through researching, planning, and management.

Ⅲ. Cultivating students to become professional engineers with care in environment and professional ethics.

Ⅳ. Preparing students with the capabilities of engaging in international engineering business, to adapt to globalization and social needs, and to expand their global perspectives.

Subject Departmental core competences

A. Mathematical and engineering knowledge needed for water resources and environmental engineering applications.(ratio:10.00)

B. Capabilities of planning and conducting experiments, analyzing and explaining experimental data, applying information tool, and collecting and compiling data. (ratio:10.00)

C. Logical thinking, analysis, integration, problem-solving skills, engineering planning, design and implementation ability.(ratio:30.00)

D. Skill of using professional foreign language and global perspective.(ratio:30.00)

E. Capabilities of writing and presenting research report.(ratio:10.00)

F. Awareness of the importance of teamwork, working attitude and professional ethics, and to learn continuously.(ratio:10.00)

Subject Schoolwide essential virtues

1. A global perspective. (ratio:10.00)

2. Information literacy. (ratio:10.00)

3. A vision for the future. (ratio:10.00)

4. Moral integrity. (ratio:10.00)

5. Independent thinking. (ratio:30.00)

6. A cheerful attitude and healthy lifestyle. (ratio:10.00)

7. A spirit of teamwork and dedication. (ratio:10.00)

8. A sense of aesthetic appreciation. (ratio:10.00)

Course Introduction	In this course, chemical equilibrium modeling software will be used to model water and wastewater treatment processes. Selected papers related to acid/base, precipitation, complexation, and gas/liquid equilibrium will be discussed.

The correspondences between the course's instructional objectives and the cognitive, affective, and psychomotor objectives.

Differentiate the various objective methods among the cognitive, affective and psychomotor domains of the course's instructional objectives.

I. Cognitive : Emphasis upon the study of various kinds of knowledge in the cognition of the course's veracity, conception, procedures, outcomes, etc.

II.Affective : Emphasis upon the study of various kinds of knowledge in the course's appeal, morals, attitude, conviction, values, etc.

III.Psychomotor: Emphasis upon the study of the course's physical activity and technical manipulation.

No.	Teaching Objectives	objective methods
1	1.Understand the fundamental principles and applications of key environmental unit operations in pollution control and resource recovery. 2.Analyze the design, performance, and efficiency of unit processes such as adsorption, membrane filtration, and advanced oxidation. 3.Evaluate emerging technologies and sustainable practices in environmental engineering to address current and future challenges.	Cognitive

The correspondences of teaching objectives : core competences, essential virtues, teaching methods, and assessment

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment

1	ABCDEF	12345678	Lecture, Discussion	Testing, Study Assignments, Discussion(including classroom and online), Report(including oral and written)

Course Schedule

Week	Date	Course Contents	Note
1	114/09/15 ~ 114/09/21	Introduction	
2	114/09/22 ~ 114/09/28	Overview current wastewater treatment technologies	
3	114/09/29 ~ 114/10/05	Physic-chemical processes: Advanced Oxidation Processes (AOPs)	
4	114/10/06 ~ 114/10/12	Physic-chemical processes: Advanced Oxidation Processes (AOPs) (Continue)	
5	114/10/13 ~ 114/10/19	Physic-chemical processes in high-tech wastewater treatment	
6	114/10/20 ~ 114/10/26	Physic-chemical processes in high-tech wastewater treatment (Continue)	
7	114/10/27 ~ 114/11/02	Papers: Advanced Oxidation Processes (AOPs)	
8	114/11/03 ~ 114/11/09	Papers: High-tech wastewater treatment	
9	114/11/10 ~ 114/11/16	Midterm Exam Week	
10	114/11/17 ~ 114/11/23	Industrial filtration: Pre-filtration manufacturing	
11	114/11/24 ~ 114/11/30	Industrial filtration: Prefiltration application	
12	114/12/01 ~ 114/12/07	Industrial filtration: Prefiltration application (Continue)	
13	114/12/08 ~ 114/12/14	Industrial filtration: Prefiltration application	
14	114/12/15 ~ 114/12/21	Industrial filtration: Membrane fabrication	
15	114/12/22 ~ 114/12/28	Industrial filtration: Membrane fabrication (Continue)	
16	114/12/29 ~ 115/01/04	Industrial filtration: Membrane filtration	
17	115/01/05 ~ 115/01/11	Final exam week	
18	115/01/12 ~ 115/01/18	Flexible teaching week	

Key capabilities	

Interdisciplinary	
Distinctive teaching	
Course Content	Environmental Safety Green Energy
Requirement	
Textbooks and Teaching Materials	Self-made teaching materials:Presentations Using teaching materials from other writers:Textbooks Name of teaching materials: Reynolds, Tom D., and Paul A. Richards. Unit operations and processes in environmental engineering. PWS Publishing company, 1996.
References	Reynolds, Tom D., and Paul A. Richards. Unit operations and processes in environmental engineering. PWS Publishing company, 1996. Hilal, Nidal, Ahmad Fauzi Ismail, and Chris Wright, eds. Membrane fabrication. CRC Press, 2015. Ameta, Suresh C., and Rakshit Ameta, eds. Advanced oxidation processes for wastewater treatment: emerging green chemical technology. Academic press, 2018.
Grading Policy	◆ Attendance： 10.0 % ◆ Mark of Usual： % ◆ Midterm Exam： 40.0 % ◆ Final Exam： 50.0 % ◆ Other〈 〉： %
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at https://web2.ais.tku.edu.tw/csp or through the link of Course Syllabus Upload posted on the home page of TKU Office of Academic Affairs at http://www.acad.tku.edu.tw/CS/main.php. ※"Adhere to the concept of intellectual property rights" and "Do not illegally photocopy, download, or distribute." Using original textbooks is advised. It is a crime to improperly photocopy others' publications.