Tamkang University Academic Year 104, 1st Semester Course Syllabus

Course Title	ADVANCED PHYSICAL CHEMICAL TREATMENT PROCESSES	Instructor	CHING-YU PENG
Course Class	TEWXD1A DOCTORAL PROGRAM, DEPARTMENT OF WATER RESOURCES AND ENVIRONMENTAL ENGINEERING, 1A	Details	◆ Selective ◆ One Semester ◆ 3 Credits

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.

Departmental core competences

A. With mathematical and engineering knowledge needed for water resources and environmental engineering applications.

B. With capabilities of planning and conducting experiments, and analyzing and explaining experimental data.

C. With capabilities to apply information tool, and to collect and compile data.

D. With logical thinking, analysis, integration, and problem-solving skills.

E. With engineering planning, design and implementation ability.

F. With skill of using professional foreign language and global perspective.

G. With capabilities of writing and presenting research report.

H. Awareness of the importance of teamwork, working attitude and professional ethics, and to learn continuously.

Course Introduction	Special topics of advanced physical-chemical treatment processes are introduced. The processes of oxidation and reduction, coagulation and flocculation, membrane filtration, adsorption, ion exchange, reverse osmosis, and removal of selected constituents are discussed.

The Relevance among Teaching Objectives, Objective Levels and Departmental core competences

I.Objective Levels (select applicable ones) :

(i) Cognitive Domain : C1-Remembering, C2-Understanding, C3-Applying, C4-Analyzing, C5-Evaluating, C6-Creating

(ii) Psychomotor Domain : P1-Imitation, P2-Mechanism, P3-Independent Operation, P4-Linked Operation, P5-Automation, P6-Origination

(iii) Affective Domain : A1-Receiving, A2-Responding, A3-Valuing, A4-Organizing, A5-Charaterizing, A6-Implementing

II.The Relevance among Teaching Objectives, Objective Levels and Departmental core competences :

(i) Determine the objective level(s) in any one of the three learning domains (cognitive, psychomotor, and affective) corresponding to the teaching objective. Each objective should correspond to the objective level(s) of ONLY ONE of the three domains.

(ii) If more than one objective levels are applicable for each learning domain, select the highest one only. (For example, if the objective levels for Cognitive Domain include C3,C5,and C6, select C6 only and fill it in the boxes below. The same rule applies to Psychomotor Domain and Affective Domain.)

(iii) Determine the Departmental core competences that correspond to each teaching objective. Each objective may correspond to one or more Departmental core competences at a time. (For example, if one objective corresponds to three Departmental core competences: A,AD, and BEF, list all of the three in the box.)

No.	Teaching Objectives	Relevance	
		Objective Levels	Departmental core competences
1	1. Understand the theory and mechanisms governing advanced physical and chemical treatment processes	C2	AF
2	2. Understand and apply the theory underlying each process	C3	DFG

Teaching Objectives, Teaching Methods and Assessment

No.	Teaching Objectives	Teaching Methods	Assessment
1	1. Understand the theory and mechanisms governing advanced physical and chemical treatment processes	Lecture, Discussion	Presentati
2	2. Understand and apply the theory underlying each process	Lecture, Discussion	Presentati

This course has been designed to cultivate the following essential qualities in TKU students

Essential Qualities of TKU Students	Description
◆ A global perspective	Helping students develop a broader perspective from which to understand international affairs and global development.
◆ Information literacy	Becoming adept at using information technology and learning the proper way to process information.
◆ A vision for the future	Understanding self-growth, social change, and technological development so as to gain the skills necessary to bring about one's future vision.
◇ Moral integrity	Learning how to interact with others, practicing empathy and caring for others, and constructing moral principles with which to solve ethical problems.
◆ Independent thinking	Encouraging students to keenly observe and seek out the source of their problems, and to think logically and critically.
◇ A cheerful attitude and healthy lifestyle	Raising an awareness of the fine balance between one's body and soul and the environment; helping students live a meaningful life.
◆ A spirit of teamwork and dedication	Improving one's ability to communicate and cooperate so as to integrate resources, collaborate with others, and solve problems.
◇ A sense of aesthetic appreciation	Equipping students with the ability to sense and appreciate aesthetic beauty, to express themselves clearly, and to enjoy the creative process.

Course Schedule

Week	Date	Subject/Topics	Note
1	104/09/14 ~ 104/09/20	Introduction to physical-chemical treatment processes	
2	104/09/21 ~ 104/09/27	ntroduction to separation processes and mass transfer	
3	104/09/28 ~ 104/10/04	Chemical oxidation and reduction (I)	
4	104/10/05 ~ 104/10/11	Chemical oxidation and reduction (II)	
5	104/10/12 ~ 104/10/18	Chemical oxidation and reduction (III)	
6	104/10/19 ~ 104/10/25	Coagulation, mixing, and flocculation (I)	
7	104/10/26 ~ 104/11/01	Coagulation, mixing, and flocculation (II)	
8	104/11/02 ~ 104/11/08	Membrane filtration (I)	
9	104/11/09 ~ 104/11/15	Membrane filtration (II)	
10	104/11/16 ~ 104/11/22	Midterm Exam	
11	104/11/23 ~ 104/11/29	Adsorption	
12	104/11/30 ~ 104/12/06	Visiting Industrial	

13	104/12/07 ~ 104/12/13	Ion exchange	
14	104/12/14 ~ 104/12/20	Reverse osmosis (I)	
15	104/12/21 ~ 104/12/27	Reverse osmosis (II)	
16	104/12/28 ~ 105/01/03	Removal of selected constituents (I)	
17	105/01/04 ~ 105/01/10	Removal of selected constituents (II)	
18	105/01/11 ~ 105/01/17	Final Exam	

Requirement	1. There will be paper presentation, and journal review. Missed paper presentation or journal review counts as a zero. 2. All discussion, presentation, and journal review should be presented and written in English.
Teaching Facility	Computer, Projector
Textbook(s)	Water & Wastewater Engineering: Design Principles & Practice, Davis, 2011
Reference(s)	Selected papers Water Treatment Principles and Design, 2nd ed. by Montgomery Watson Harza
Number of Assignment(s)	7 (Filled in by assignment instructor only)
Grading Policy	◆ Attendance： 10.0 % ◆ Mark of Usual： % ◆ Midterm Exam： 30.0 % ◆ Final Exam： 30.0 % ◆ Other〈Disscusion〉：30.0 %
Note	This syllabus may be uploaded at the website of Course Syllabus Management System at http://info.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 . **※ Unauthorized photocopying is illegal. Using original textbooks is advised. It is a crime to improperly photocopy others' publications.**