

Tamkang University Academic Year 114, 1st Semester Course Syllabus

Course Title	SPECIAL TOPICS IN SEMICONDUCTOR WASTEWATER TREATMENT AND WATER RECLAMATION	Instructor	LI, CHI-WANG
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 SDG7 Affordable and clean energy SDG13 Climate action		
D e p a r t m e n t a l A i m o f E d u c a t i o n			
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:20.00) B. Capabilities of planning and conducting experiments, analyzing and explaining experimental data, applying information tool, and collecting and compiling data. (ratio:20.00) C. Logical thinking, analysis, integration, problem-solving skills, engineering planning, design and implementation ability.(ratio:20.00) D. Skill of using professional foreign language and global perspective.(ratio:10.00) E. Capabilities of writing and presenting research report.(ratio:20.00) 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:15.00) 2. Information literacy. (ratio:20.00) 3. A vision for the future. (ratio:10.00)			

<div>4. Moral integrity. (ratio:5.00)</div> <div>5. Independent thinking. (ratio:30.00)</div> <div>6. A cheerful attitude and healthy lifestyle. (ratio:5.00)</div> <div>7. A spirit of teamwork and dedication. (ratio:10.00)</div> <div>8. A sense of aesthetic appreciation. (ratio:5.00)</div>				
Course Introduction		This course explores advanced concepts and challenges in managing and reclaiming semiconductor wastewater. It covers cutting-edge physical, chemical, and biological treatment technologies specifically tailored for complex effluents containing heavy metals, organic pollutants, and unique contaminants. Students will gain a comprehensive understanding of sustainable water management, regulatory aspects, and economic considerations through research analysis. Topics include zero liquid discharge (ZLD), resource recovery, advanced oxidation, and membrane technologies.		
<div>The correspondences between the course's instructional objectives and the cognitive, affective, and psychomotor objectives.</div> <div>Differentiate the various objective methods among the cognitive, affective and psychomotor domains of the course's instructional objectives.</div> <div>I. Cognitive : Emphasis upon the study of various kinds of knowledge in the cognition of the course's veracity, conception, procedures, outcomes, etc.</div> <div>II.Affective : Emphasis upon the study of various kinds of knowledge in the course's appeal, morals, attitude, conviction, values, etc.</div> <div>III.Psychomotor: Emphasis upon the study of the course's physical activity and technical manipulation.</div>				
No.	Teaching Objectives		objective methods	
1	Students will critically evaluate advanced physical, chemical, and biological technologies for complex semiconductor wastewater treatment and their applicability.		Cognitive	
2	Students will propose and justify sustainable water reclamation and resource recovery strategies for semiconductor manufacturing, considering technical, regulatory, and economic factors.		Psychomotor	
The correspondences of teaching objectives : core competences, essential virtues, teaching methods, and assessment				
No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABCDEF	12345678	Discussion, Publication	Study Assignments, Discussion(including classroom and online), Report(including oral and written)

2	ABCDEF	12345678	Practicum	Practicum
Course Schedule				
Week	Date	Course Contents	Note	
1	114/09/15 ~ 114/09/21	Introduction to Semiconductor Industry & Water Challenges		
2	114/09/22 ~ 114/09/28	Advanced Physical Treatment Technologies		
3	114/09/29 ~ 114/10/05	Advanced Chemical Treatment Technologies		
4	114/10/06 ~ 114/10/12	Advanced Biological Treatment & Bioremediation		
5	114/10/13 ~ 114/10/19	Zero Liquid Discharge (ZLD) Strategies & Technologies		
6	114/10/20 ~ 114/10/26	Resource Recovery from Wastewater		
7	114/10/27 ~ 114/11/02	Analytical Methods & Real-time Monitoring		
8	114/11/03 ~ 114/11/09	Process Automation & Artificial Intelligence		
9	114/11/10 ~ 114/11/16	Midterm Examination		
10	114/11/17 ~ 114/11/23	Water Reclamation for Various Uses		
11	114/11/24 ~ 114/11/30	Case Studies I: Advanced Treatment Applications		
12	114/12/01 ~ 114/12/07	Case Studies II: Water Reclamation & ZLD Successes		
13	114/12/08 ~ 114/12/14	Emerging Technologies & Future Trends		
14	114/12/15 ~ 114/12/21	Student Presentations & Course Review		
15	114/12/22 ~ 114/12/28	Student Presentations & Course Review		
16	114/12/29 ~ 115/01/04	Final Examination		
17	115/01/05 ~ 115/01/11	Reflection and Future Directions		
18	115/01/12 ~ 115/01/18	Individual Consultations		
Key capabilities		self-directed learning Problem solving		
Interdisciplinary		STEAM course (S:Science, T:Technology, E:Engineering, M:Math, A field:Integration of Art and Humanist)		

Distinctive teaching	
Course Content	Logical Thinking Environmental Safety Green Energy Sustainability issue
Requirement	
Textbooks and Teaching Materials	Self-made teaching materials:Presentations Using teaching materials from other writers:Journal papers
References	
Grading Policy	<p>◆ Attendance : % ◆ Mark of Usual : % ◆ Midterm Exam : %</p> <p>◆ Final Exam : %</p> <p>◆ Other 〈reprot〉 : 100.0 %</p>
Note	<p>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.</p> <p>※"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.</p>