Tamkang University Academic Year 113, 1st Semester Course Syllabus

Course Title	WASTEWATER ENGINEERING	Instructor	
Course Class	TEWXB3A DEPARTMENT OF WATER RESOURCES AND ENVIRONMENTAL ENGINEERING, 3A	Details	◆ General Course ◆ Required ◆ 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. Educating students with the fundamental knowledge of mathematics, science and engineering to enable them to succeed in the practice or academic research related to water resources and environmental engineering.

1. Training students with engineering basics to equip them with the capabilities of construction supervision and operation management.
2. Cultivating students with ability of applying engineering theory and pursuing innovation to equip them with the capabilities of researching, planning, engineering design, integration and assessment.
3. Training students with capacity to apply information technology in the engineering business.

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

1. Cultivating students with characters of respecting the nature and humane care.
2. Cultivating students with engineering ethics and law-abiding character.
3. Preparing students with the capabilities of exploring, analyzing, interpreting, and dealing with problems.

Ⅲ. Preparing students with the capabilities of engaging in domestic and international engineering business.

1. Cultivating students with the capabilities of project management, presentation and communication skills, and teamwork.
2. Preparing students with the capabilities of applying professional foreign language and expanding their global perspective.
3. Cultivating students with cognitive and habits of continuous learning.

Subject Departmental core competences

A. Basic mathematical and engineering knowledge needed for water resources and environmental engineering applications.(ratio:20.00)

B. Capabilities of engineering planning, design, and information applications.(ratio:20.00)

C. Capabilities of logical thinking, analysis, integration, problem-solving skills, innovative design and engineering implementation.(ratio:30.00)

D. Continuous learning of the up-to-date knowledge of professional engineering, professional foreign language skills and global perspective.(ratio:20.00)

E. Awareness of the importance of teamwork and working attitude, and with cognition of professional ethics.(ratio:10.00)

Subject	Schoolwide essential virtues

1. A global perspective. (ratio:25.00)
2. Information literacy. (ratio:15.00)
3. A vision for the future. (ratio:10.00)
4. Moral integrity. (ratio:5.00)
5. Independent thinking. (ratio:25.00)
6. A cheerful attitude and healthy lifestyle. (ratio:5.00)
7. A spirit of teamwork and dedication. (ratio:10.00)
8. A sense of aesthetic appreciation. (ratio:5.00)

Course Introduction	In this course, Process kinetics, mass balance, reactor design, pretreatment, clarification, chemical treatment, biological treatment (aerobic and anaerobic), disinfection, sludge treatment, nitrogen and phosphorus removal 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. To understand and analyze the characteristics of water and wastewater 2. To estimate the quantity of drinking water and domestic wastewater generated 3. To understand the unit operations involved in the water supply systems and sewerage system 4. To know the design process of water and waste water unit operations & system	Cognitive

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

No.	Core Competences	Essential Virtues	Teaching Methods	Assessment
1	ABCDE	12345678	Lecture, Discussion	Testing, Report(including oral and written)

Course Schedule

Week	Date	Course Contents	Note
1	113/09/09 ~ 113/09/15	Introduction	
2	113/09/16 ~ 113/09/22	Introduction: Wastewater Treatment and Process Analysis	
3	113/09/23 ~ 113/09/29	Introduction: Wastewater Characteristics	
4	113/09/30 ~ 113/10/06	Wastewater Flowrates and Reaction Vessels	
5	113/10/07 ~ 113/10/13	Process Selection	
6	113/10/14 ~ 113/10/20	Design, and Implementation Physical Unit Processes	
7	113/10/21 ~ 113/10/27	Chemical Unit Processes	
8	113/10/28 ~ 113/11/03	Suspended Growth Biological Treatment Processes	
9	113/11/04 ~ 113/11/10	Midterm Exam/Midterm Assessment Week (teachers can adjust the week as needed)	
10	113/11/11 ~ 113/11/17	Attached Growth and Combined Biological Treatment Processes	
11	113/11/18 ~ 113/11/24	Anaerobic Suspended and Attached Growth Biological Treatment Processes	
12	113/11/25 ~ 113/12/01	Separation Processes for Removal of Residual Constituents, Disinfection Processes	
13	113/12/02 ~ 113/12/08	Processes and Treatment of Sludges Biosolids Processing, Resource Recovery and Beneficial Use	

14	113/12/09～ 113/12/15	Air Emissions from Wastewater Treatment Facilities and Their Control Energy Considerations in Wastewater Management	
15	113/12/16～ 113/12/22	Wastewater Management: Future Challenges and Opportunities	
16	113/12/23～ 113/12/29	Group discussion	
17	113/12/30～ 114/01/05	Final Exam/Final Assessment Week (teachers can adjust the week as needed)	
18	114/01/06～ 114/01/12	Flexible Teaching Week: Generally, no in-person classes; teachers may arrange teaching activities or final assessments, among other options.	

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
Requirement	
Textbooks and Teaching Materials	Self-made teaching materials:Presentations Using teaching materials from other writers:Textbooks Name of teaching materials: Metcalf & Eddy /AECOM. Wastewater Engineering: Treatment and Resource Recovery, 5th Edition, McGraw-Hill, 2013 (ISBN 13: 978-0073401188, ISBN 10: 0073401188)
References	Reynolds, Tom D., and Paul A. Richards. Unit operations and processes in environmental engineering. PWS Publishing company, 1996. Ameta, Suresh C., and Rakshit Ameta, eds. Advanced oxidation processes for wastewater treatment: emerging green chemical technology. Academic press, 2018.
Grading Policy	◆ Attendance： %　◆ Mark of Usual： %　◆ Midterm Exam： 50.0 % ◆ Final Exam： 50.0 % ◆ Other〈 〉： %

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.**