Department of Petroleum Technology

Erbil Technology Institute

University of Polytechnic-Erbil

Subject: Wastewater Engineering

Course Book – (Year 2)

Lecturer's name: MSc. Chia Hussain Abdoulqadir

Academic Year: *2022-2023*

Course Book

1. Course name	**Wastewater Engineering WWE401**
2. Lecturer in charge	**Chia Hussain Abdoulqadir**
3. Department/ College	**Petroleum Technology/Erbil Technology Institute**
4. Contact	**e-mail: chia.abdoulqadir@epu.edu.iq** **Tel: 07701436109 or 07518021440**
5. Time (in hours) per week	**Theory: 2 Face to face hours 55** **Practical: 2 Home Hours 112**
6. Office hours	**Sunday 12:30-2:30 Monday 12:30-2:30**
7. Course code	**WWE401**
8. Teacher's academic profile	**The general specialty of my academic background is the science of geology in University of Sulaimani which includes many branches too. However, my specific specialty is going toward Environmental Geology and Environmental management from the master of science from UK predominantly with wastewater engineering. Participated and organized in many conferences, symposiums, and workshops. Beside, presented many seminars in different sectors and organizations. I am also an IOSH managing safely certified. IRCA Certified Lead Auditor for ISO 45001: 2018 Health and safety and ISO 14001:2015 Environmental Management system.**
9. Keywords	**Environment, prevention, control, policy, and procedure. Wastewater, Nutrient, coagulation and flocculation.**

10. Course overview:

the significance of Wastewater in the oil and gas industry now a day is becoming more and more predominant, especially when the case is all about a developing country that we live in. this course intends to propose a basic but not too detailed information about the concept of Wastewater and the related issues especially in the world of oil and gas industry. The ideologies and models of different wastewater engineering challenges will be discussed and deliberated to the students in a way that allows them to be equipped with sufficient information to enhance them in meeting with oil and gas company's expectation. Beside, this course is designed to allow and secure a participant an almost a guaranteed employment if they complete the course successfully.

11. Course objective:

Understand the conceptual and theoretical underpinning of the world of wastewater engineering. Study briefly about wastewater engineering.

Concepts of workplace wastewater engineering will be discussed as they related to the oil, gas, petrochemical and associated industries. Students will develop an understanding of how businesses manage Wastewater and the regulatory responsibilities, and be able to prepare for further study in the field. Included is a historical perspective of the legislative process of regulations, explanation of HSE terms especially from environmental point of view, ethics and professionalism, recordkeeping and water component statistics, hazard recognition / evaluation / control, accident investigation and analysis, emergency preparedness, security, workers' compensation, concepts of pollution control, waste management, EIA, and wastewater management systems.

12. Student's obligation

Missed classes will not be compensated including the quizzes and the scheduled assignments. The students will lose marks on unattended classes with quizzes unless a legal document or authorized leave is presented which should explain the excuse of the absence. However, the absent student should take the responsibility for making up the missed lecture.

13. Forms of teaching

many useful tools will be used in this course to enhance the students to get better understanding including coloured markers, slideshows, white board, smart board, and hand-outs.

14. Assessment scheme

The grade of the subject is divided onto several sections as follows

Seasonal examination	25
Quizzes and report	15
Classroom participation and reporting	10
Final exam	50
Total grade or mark	100

Erbil Technology college

Program: Diploma (120 ECTS) 4th. Semester

Total No. of Weeks/Semester: 16 weeks

Department name: Petrolum Technology Department

Lecturer Name: جیا حسین عبدالقادر

Module Name: Waste Water Engineering

Module Code: WWE401 Group: All

Theory	Practical	Tutorial
2	2	

ECTS Workload Calculation Form

Activity	S	Description		Activity Type	No.	Time Factor	Workload
Course	1	Theory	In class	f	6	**2**	12
	2		Online	f	6	**2**	12
	3	Preparation (1.5)* Theory		h	12	**3**	36
	4	Practical		f	12	**2**	24
	5	Preparation (1)* practical		h	12	**2**	24
	6	Tutorial		f			
Site Visits		Scientific/Field Trips		f			
		Lab. Reports & Activities		f	5	**1.25**	6.25
Assignment	7	Homework		h	2	2	4
	8	Report		h	1	2	2
	9	Seminar		h	1	5	5
	10	Paper		h		12	
	11	Essay		h		8	
	12	Project		h		10	
Assessment	13	Quiz		h	4	1	4
	14	Mid Term	Theory	f	1	2	2
	15		Preparation	h	1	**6**	6
	16		Practical	f	1	1	1
	17		Preparation	h	1	**4**	4
	18	Final	Theory	f	1	2	2
	19		Preparation	h	1	**8**	8
	20		Practical	f	1	2	2
	21		Preparation	h	1	**6**	6
Face to face hours (f) / (12) week			**5.08**	Face to face hours (f)			**61**
Home hours (h) / (16) week			**6.19**	Home hours (h)			**99**
Total hours / (16) week			**10.00**	Total hours			**160**
ECTS (Total hours / 27) ≈ 6							**5.9**

Underlined numbers must not be changed.
f: Face to face activity hours
h: Household activity hours

15. Student learning outcome:

This course book has been designed as a reference to acquaint you with the requirements of most oil and gas companies and assist you in compliance for the purpose of achieving incident-free performance. It is meant to provide you with a reference source for policies, safety rules, standards, procedures and guidelines that affect the safety and health of you and your co-workers.

16. Course Reading List and References:

Metcalf & Eddy, Wastewater Engineering, Treatment and reuse. (2004) Fourth Edition, McGrawHill

Benjamin O. ALLI, Fundamental principles of occupational health and safety. (2008) second edition, International Labour Organization

Handi-guide to alberta's OH & S act, regulation and codes. (2014) Carswell, a division of Thomson reuters Canada limited

Health and safety test. (2006) Thomson Prometric, printed in UK

The Environmental Impact Assessment of petroleum operations, instruction No.1 (2014) Ministry of Natural Resources

Technical Guideline on The Environmental Impact Assessment of petroleum operations in the Kurdistan Region of Iraq (2014) Ministry of Natural Resources

17. The Topics:	**Lecturer's name**
Introduction to Wastewater • What is a wastewater • What are wastewater's main components • Obligations	Chia Hussain (2 hrs) Week 1
Wastewater problem origins • History of wastewater problems • International wastewater outbreaks • Everyone's Responsibilities toward WW	Chia Hussain (2 hrs) Week 2
Mass Balance • concept of mass balance • mass balance calculations • case study and exercise	Chia Hussain (2 hrs) Week 3
Physiochemical Process of Wastewater • Coagulation and flocculation • Physical separation • Membrane separation	Chia Hussain (2 hrs) Week 4

Biological processes for wastewater treatment • Microbial organism • Bioremediation • Biodegradation Concept	Chia Hussain (2 hrs) Week 5
Introduction to wastewater Treatment • Why treat wastewater • Sewage-load • Conventional Sewage Treatment	Chia Hussain (2 hrs) Week 6
Conventional Sewage Treatment • Preliminary treatment • Primary sedimentation • Secondary Treatment	Chia Hussain (2 hrs) Week 7
Secondary Treatment • Trickling filters • Activation sludge plant • Simplified activated sludge description	Chia Hussain (2 hrs) Week 8
Tertiary Treatment • Cuts and wounds • Animal bites • Basic life support and initial response	Chia Hussain (2 hrs) Week 9
Sour gas H_2S and NORM • Deep bed sand filter • Submerged Aerated Filters • Rotating Bio-disc contactors	Chia Hussain (2 hrs) Week 10
Sludge • What is sludge • why treat sludge • Surplus activated sludge • Digestion	Chia Hussain (2 hrs) Week 11
Trickling Filters • Trickling filter layout • Drive mechanism • Design • Exercises	Chia Hussain (2 hrs) Week 12
Activated Sludge Plant • Activated sludge Plant Process • Tank Configuration • Basic Process design Parameters • Sludge Age	Chia Hussain (2 hrs) Week 13

• Exercises	
The World of Sludge • Sources and Characteristics of sewage sludge • Sludge production calculation • Options for treating sludge • Designing an anaerobic digestion plant	Chia Hussain (4 hrs) Week 14
Anaerobic Digestion • What is sludge digestion • Types of Digestion • Composition of sludge • Main Design Consideration • Design a digestion center	Chia Hussain (4 hrs) Week 15
Waste Stabilization Pond • Types of waste stabilization Pond • Design Parameters • Anaerobic pond design • Facultative pond Design	Chia Hussain (2 hrs) Week 16
Nutrient Removal • What are nutrients • Sources of nutrients • Why Remove nutrients • How to remove P from sewage	Chia Hussain (4 hrs) Week 17
18. Practical Topics: Four site visits to Kawrgosk water treatment plant, Italian Village2 wastewater Treatment plant, PEPSI Erbil wastewater treatment plant and KAR Group treatment plant.	

Type of question	Example
Multiple choice	
Short answer	
Matching pairs	**Match the following statements in the column A with the definitions in the column B:**

A	B
1. Waste water	A. Vessel
2. Reactor	**B. Municipal and industrial**
3. Physical properties of drinking water	C. Turbidity,tastes

	4. River stream contains	**D. To take water for small hights**
	5. Lake contains	**E. Solids and bacteria**
	6. Low lift pumping	F. Algae,,,solids
	7.	G.
	8.	H.
	9.	**I.**
	10.	J.
	Answer for matching pairs: 1...B,2...A,3...C,4...E,5...F,6...D	
Definition	**Define the following terms: Waste water, suspended solid, Heavy metals** **Answers; Waste water, Is defined as a combination of the liquid or water carried wastes removed from the residences, institutions together with such ground water, surface water.** **Suspended solid; This can led to the development of sludge deposit and anaerobic conditions when un treated waste water is discharged in the aquatic environment.** **Heavy metals; Are usually added to waste water from commercial and industrial activities and may have to be removed if the waste water is to be reused.**	
Problem situation		
Quiz	yes	

20. Extra notes:

It is NOT intended that this course book be used as an all-inclusive source of safe practices. Our objective is to provide a safe and compliant work environment that is conducive to both personal and professional growth.

21. Peer review

The aim of this course is to direct the student toward a better understanding about wastewater treatments in its detailed processes which Mr. Chia did it clearly in the course syllabus and this course details and covers the main aspects too.

Dr. Farzand kamal Medhat