Ministry of Higher Education
and Scientific Research
University of Babylon
College of Engineering
Department of Environmental Engineering

Academic Program

and Course Description

for the B.Sc. in Environmental Engineering Program

2025

Introduction:

The Bachelor of Science in Environmental Engineering program is one of the core academic programs at the College of Engineering, University of Babylon. The program aims to prepare graduates capable of analyzing environmental problems and developing sustainable solutions, by integrating engineering knowledge with environmental understanding, in line with modern scientific developments and national development requirements.

The program lasts four years and follows a coursework system. Students graduate after completing eight courses, along with summer internship requirements and a final graduation project. This enhances their practical skills and helps them gain a deeper understanding of practical aspects.

The program strives to keep pace with developments in the field of environmental engineering through continuous curriculum development in line with the labor market and global developments in engineering education. Furthermore, the Bachelor of Science in Environmental Engineering program enhances students' capabilities in various fields, including water and wastewater treatment, air quality, waste management, sustainable energy technologies, and environmental assessment.

It also promotes professional and ethical values and encourages creativity and community service. Graduates of the program can work in various fields within the public and private sectors, such as ministries concerned with the environment and water resources, municipalities, regulatory bodies, consulting and contracting firms, environmental laboratories, as well as research centers and infrastructure and sustainable development projects.

Academic Program Description

University Name:	University of Babylon
Faculty/Institute:	College of Engineering
Scientific Department:	Department of Environmental Engineering
Academic or Professional Program Name:	B.Sc. in Environmental Engineering Program
Final Certificate Name:	in Environmental Engineering BSC
Academic System:	(The third stage to the fourth stage - semester system)
Description Preparation Date:	1/9/2025
File Completion Date:	1/9/2025

Signature:
Asst. prof. Dr. Ali Jalil Chabuk
Head of Department
Date:

Signature:
prof. Dr. Ali Hasson Nahhab
Scientific Associate
Date:

The file is checked by:
Department of Quality Assurance and University Performance
Director of the Quality Assurance and University Performance Department:
Name: Asst. prof. Dr. Zainab Ali Omran
Date:
Signature:

جامعة بابل
كلية الهندسة
مكتب العميد

Approval of the Dean

1. Program Vision

The Bachelor of Environmental Engineering program contributes to sustainable development, environmental protection, and environmental research, and provides innovative solutions to address the most pressing global environmental challenges.

2. Program Mission

The Bachelor of Environmental Engineering program is committed to preparing scientifically and professionally qualified environmental engineers who possess the knowledge and skills necessary to diagnose environmental problems and develop sustainable solutions. This is achieved through an advanced educational environment, the encouragement of scientific research, and the building of effective partnerships with the community and relevant institutions.

3. Program Objectives

- Qualifying graduates with solid scientific and engineering knowledge in the fields of environmental engineering**.**
- Enabling graduates to work effectively within multidisciplinary teams in the public and private sectors**.**
- Enhancing the ability to think and solve environmental problems based on scientific and professional foundations**.**
- Supporting scientific research and continuously updating curricula to keep pace with advances in the fields of environment and engineering**.**
- Instilling ethical values and social responsibility among graduates, encouraging them to contribute to environmental protection and achieving sustainable development goals.

4. Program Accreditation

The accredited program is the Accreditation Board for Engineering and Technology (ABET). However, it does not have program accreditation.

5. Other external influences

Training courses for students to develop their professional skills / field visits / summer training.

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	**Bologna system = 3** **Semester system = 0**	**Bologna system = 6** **Semester system = 0**	**%5.7** **%0**	**Basic**
College Requirements	**0**	**0**	**0%**	
Departments Requirements	**Bologna system = 50** **Semester system= 63**	**Bologna system = 234** **Semester system = 148**	**%94.3** **%100**	**Basic**
Summer Training	**1**	**0**	**0%**	**Basic**
Other	**0**	**0**	**0%**	

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours		
			Theoretical	Tutorial	Practical
First-year First-semester	**UOBAB0105011**	**Mathematics I**	**4**	**1**	**0**
	UOBAB0105012	**Engineering Mechanics I**	**4**	**1**	**0**
	UOBABb4	**Computer Programming I**	**1**	**0**	**2**
	UOBAB0105014	**Engineering and Auto Cad Drawing I**	**2**	**0**	**4**
	UOBAB0105015	**Microbiology**	**2**	**0**	**2**

	UOBABb3	Democracy and human rights	2	0	0
	UOBABb1	English Language I	2	0	0
First-year Second-semester	UOBAB0105021	Mathematics II	4	1	0
	UOBAB0105022	Engineering Mechanics II	4	1	0
	UOBAB0105023	Computer Programming II	1	0	2
	UOBAB0105024	Engineering and Auto Cad Drawing II	2	0	4
	UOBABb2	Arabic Language	2	0	0
	UOBAB0105026	Introduction to Environmental Engineering	2	0	0
	UOBAB0105025	Engineering Geology	2	1	0
Second-year First-semester	ENV2301	Mathematics III	3	1	0
	ENV2302	Strength of Materials I	3	1	0
	ENV2303	Fluid Mechanics I	2	1	2
	ENV2304	Engineering Surveying	2	1	2
	ENV2305	Environmental Protection I	2	2	0
	ENV2306	Engineering Statistics	2	2	0
	UOBAB2001	Arabic Language II	2	0	0
	UOBAB2301	Crimes of the defunct Baath Party	2	0	0
Second year Second semester	ENV2401	Mathematics IV	3	1	0
	ENV2402	Strength of Materials II	3	1	0
	ENV2403	Fluid Mechanics II	2	1	2
	ENV2404	Environmental Protection II	2	1	0
	ENV2405	Material and Building Construction	2	1	2
	ENV2406	Chemistry	2	0	2
	UOBAB2004	Computer II	1	0	2
	UOBAB2302	English Language II	1	1	0
Third-year First-semester	En Ee Ea 3 33 1	Engineering Analysis	2	2	0
	En Ee Dcc 3 34 2	Design of Concrete Construction	2	1	0
	En Ee We 3 35 3	Water Engineering I	2	1	2
	En Ee Swm 3 36 4	Solid Waste Management	3	1	0
	En Ee Pd 3 37 5	Plumbing and Drainage I	2	1	0
	En Ee Em 3 38 6	Engineering Management	2	1	0
	En Ee Spc 3 39 7	Soil Pollution Control	2	0	2
	En Ee EL 3 40 8	English Language V	1	1	0
Third-year Second-semester	En Ee Nm 3 41 9	Numerical Methods	2	2	0
	En Ee Ts 3 42 10	Theory of Structures	2	1	0
	En Ee We 3 43 11	Water Engineering II	2	1	2
	En Ee Hwm 3 44 12	Hazardous Waste Management	3	1	0
	En Ee Pd 3 45 13	Plumbing and Drainage II	2	1	0
	En Ee Ec 3 46 14	Engineering Economy	2	1	0
	En Ee Eh 3 47 15	Engineering Hydrology	2	1	0
	En Ee EL 3 28 16	English Language VI	1	1	0
Fourth year First semester	En Ee Wre 4 49 1	Water Resources Engineering	2	1	0
	En Ee Apc 4 50 2	Air Pollution Control	2	1	2
	En Ee Wwe 4 51 3	Wastewater Engineering I	2	1	2
	En Ee Ipc 4 52 4	Industrial Pollution Control	3	1	0
	En Ee Dwdns 4 53 5	Design of Water Distribution Network Systems	2	1	0
	En Ee Ea 4 54 6	Environment and Architecture I	2	1	0
	En Ee Gp 4 55 7	Graduation Project	1	1	2
	En Ee EL 4 56 8	English Language VII	1	1	0
Fourth year Second semester	En Ee Hse 4 57 9	Hydraulic Structures Engineering	2	1	0
	En Ee Npc 4 58 10	Noise Pollution Control	2	1	2
	En Ee Wwe 4 59 11	Wastewater Engineering II	2	1	2
	En Ee En 4 60 12	Environmental Management	2	1	0
	En Ee Dwwcns 4 61 13	Design of Wastewater Collection Network Systems	2	1	0
	En Ee Ea 4 62 14	Environment and Architecture II	2	1	0
	En Ee EL 4 63 15	English Language VIII	1	1	0
	En Ee Gp 4 55 7	Graduation Project	1	1	2

8. Expected learning outcomes of the program

Knowledge

A1: Graduates will understand advanced mathematical, scientific, and engineering principles to identify, formulate, and solve complex problems in environmental engineering.
A2: Graduates will incorporate the latest technologies, policies, and best practices in the field of environmental engineering.
A3: Graduates will demonstrate comprehensive knowledge of natural environmental systems and their dynamics, including water, air, and soil.
A4: Graduates will be familiar with local and international environmental laws, regulations, and standards.

Skills

B1: Graduates will be able to design and conduct experiments, analyze and interpret data, and provide innovative solutions to environmental challenges.
B2: Graduates will communicate effectively, both orally and in writing, with technical and non-technical audiences.
B3: Graduates will be able to work effectively as members or leaders in multidisciplinary teams to address environmental issues.
B4: Graduates will be proficient in using modern engineering tools, software, and simulation techniques.

Ethics

C1: Graduates will recognize and address the ethical, social, and environmental implications of their professional practice.
C2: Graduates will engage in lifelong learning and professional development to remain current with evolving environmental engineering requirements.
C3: Graduates will demonstrate responsibility toward serving the local community and contributing to improving the quality of life.
C4: Graduates will commit to sustainable practices in all engineering activities.

9. Teaching and Learning Strategies

Teaching Strategies

- Interactive theoretical lectures
- Use of multimedia and presentations
- Field visits and practical experiments
- Brainstorming
- Seminars and discussion groups

Learning Strategies

- Self-learning through reading, individual research, and summarizing modern scientific sources.
- Practical laboratory experiments and self-analysis of results.
- Online learning
- Brainstorming and homework

10. Evaluation methods

1-Exams
2-Discussing projects
3- Summer Training
4- Practical exams

11. Faculty

Faculty Members						
No.	Academic Rank	Specialization		Special requirements /skills	Teaching staff	
		General	Special		Staff	Lecturer
1	Asst. Prof. Dr. Ali Jalil Chabuk	Civil Engineering	Environmental Engineering		Staff	
2	Prof. Dr. Alaa Hussien Wadi	Civil Engineering	Environmental Engineering		staff	
3	Prof. Dr. Amal Hamza Khalil	Civil Engineering	Environmental Engineering		Staff	
4	Prof. Rasha Salah Mahdi	Civil Engineering	Environmental Engineering		Staff	
5	Prof. Dr. Nisren Jasim Hussien Al-Mansori	Construction Engineering	Water Resources Engineering		Staff	
6	Prof. Dr. Isra'a Sadi Samaka	Civil Engineering	Environmental Engineering		Staff	
7	Prof. Dr. Nabaa Shakir Hadi	Construction Engineering and Education	Environmental Engineering/Water Pollution Control		Staff	
8	Prof. Dr. Hussein A. M. Al-Zubaidi	Civil Engineering	Environmental Engineering		Staff	
9	Prof. Dr. Khalid Safaa Hashim	Civil Engineering	Environmental Engineering		Staff	
10	Prof. Dr. Zaid Ali Hasn	Civil Engineering	Construction Material Engineering		Staff	
11	Asst. Prof. Dr. Wissam Al-Taliby	Civil Engineering	Environmental Engineering		Staff	
12	Asst. Prof. Dr. Rawaa Al-Isawi	Civil Engineering	Environmental Engineering		Staff	
13	Asst. Prof. Dr. Intidhar Jabir Idan	Civil Engineering	Environmental Engineering		Staff	
14	Asst. Prof. Dr. Fatimah Fahem Alkhafaji	Civil Engineering	Roads and Transportation Engineering		Staff	
15	Asst. Prof. Dr. Udai A Jahad	Water Resources	Water Resources		Staff	

		Engineering	Engineering			
16	Asst. Prof. Dr. Sherin Qasim Abdul Radh	Civil Engineering	Construction Engineering		Staff	
17	Lec. Dr. Hussein Hamid Emran	Civil Engineering	Environmental Engineering		Staff	
18	Lec. Dr. Salam Razaq	Civil Engineering	Construction Material Engineering		Staff	
19	Lec. Dr. Ali Abdul Hussein	Civil Engineering	Construction Engineering		Staff	
20	Lec. Dr. Waleed Ali Hasan	Civil Engineering	Construction Engineering		Staff	
21	Lec. Dr. Wathiq Jasim AlJabban	Civil Engineering	Geotechnical Engineering		Staff	
22	Asst. Prof. Afrah Abood Hasan	Civil Engineering	Environmental Engineering		Staff	
23	Lec. Ahmed Talib Sahib	Civil Engineering	Environmental Engineering		Staff	
24	Lec. Rand Sami	Civil Engineering	Water Resources Engineering		Staff	
25	Asst. Lec. Mustafa Abdul-Kareem	Civil Engineering	Environmental Engineering		Staff	
26	Asst. Lec. Fatimah Al-Zahraa Kareem	Environmental Sciences	Environmental Sciences		Staff	
27	Asst. Lec. Issra Hussien Ali	Civil Engineering	Construction Engineering		Staff	
28	Asst. Lec. Hussien Ali Hussien	Civil Engineering	Sanitary Engineering			Lecturer
29	Asst. Prof. Dr. Safaa Abdel Wahid Abboud	Faculty of Law	Faculty of Law			Lecturer
30	Asst. Lec. Rabab Naji Abdel Attia	Faculty of Law	Faculty of Law			Lecturer
32	Asst. Lec. Hiba Mohammed	Arabic Language	Etiquette			Lecturer
33	Asst. Lec. Noor Ahmed	English Education	English Language			Lecturer
34	Asst. Lec. Amer kazem Mohammed	Arabic Language	Etiquette			Lecturer

Professional Development

Monitoring new Faculty members

New faculty members are oriented by familiarizing them with the laws related to them, such as the Civil Service Code and the University Service Code, so that they can fully understand their duties and responsibilities. They are also encouraged to engage with their teaching colleagues through seminars, lectures, and various activities that enhance the experience of new faculty members and help establish a solid foundation between them and their former teaching colleagues, as the goal is one: to serve the educational institution and strengthen the bonds of cooperation and development among them.

Professional Development of Faculty members

Professional development includes holding annual courses and seminars on various aspects of environmental engineering to ensure information exchange, in addition to participating in scientific conferences inside and outside the university or abroad to learn about the most important developments that keep pace with the engineering aspect and advanced teaching methods in universities, transferring them and benefiting from scientific experiences to develop the intellectual structures of students and teachers.

12. Acceptance Criterion

Central

13. The most important sources of information about the program

- **The college and university website**
- **University guide**
- **The most important books and resources for the department**

14. Program Development Plan

The Bachelor of Environmental Engineering program aims to graduate competent engineers specializing in environmental engineering, according to the latest internationally accredited curricula. The goal is to implement various engineering projects currently needed by the country. This will be achieved by providing a high-quality engineering, educational, and research environment in this field, enabling them to build and serve their country. It will also highlight the role of environmental engineers in serving their country, contributing to civilizational development, and promoting scientific progress.

Program skills outline

Year/ Level	Course Code	Course Name	Basic or optional	Required program Learning outcomes											
				Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
First-year / First-semester	UOBAB0105011	Mathematics I	Basic	✔		✔					✔				
First-year / First-semester	UOBAB0105012	Engineering Mechanics I	Basic	✔		✔		✔		✔	✔				
First-year / First-semester	UOBABb4	Computer Programming I	Basic	✔				✔			✔				
First-year / First-semester	UOBAB0105014	Engineering and Auto Cad Drawing I	Basic					✔	✔	✔	✔				
First-year / First-semester	UOBAB0105015	Microbiology	Basic			✔		✔				✔			
First-year / First-semester	UOBABb3	Democracy and human rights	Basic				✔		✔			✔		✔	
First-year / First-semester	UOBABb1	English Language I	Basic					✔	✔				✔		
First-year / Second-semester	UOBAB0105021	Mathematics II	Basic	✔		✔					✔				
First-year / Second-semester	UOBAB0105022	Engineering Mechanics II	Basic	✔		✔		✔		✔	✔				
First-year / Second-semester	UOBAB0105023	Computer Programming II	Basic	✔				✔			✔				
First-year / Second-semester	UOBAB0105024	Engineering and Auto Cad Drawing II	Basic					✔	✔	✔	✔				
First-year / Second-semester	UOBABb2	Arabic Language	Basic					✔					✔		
First-year / Second-semester	UOBAB0105026	Introduction to Environmental Engineering	Basic	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔
First-year / Second-semester	UOBAB0105025	Engineering Geology	Basic	✔		✔		✔			✔				
Second-year / First-semester	En Ee Ma 2 17 1	Mathematics III	Basic	✔		✔					✔				
Second-year / First-semester	En Ee Sm 2 18 2	Strength of Materials I	Basic	✔		✔		✔		✔	✔				
Second-year / First-semester	En Ee Cp 2 19 3	Computer Programming III	Basic	✔		✔		✔		✔	✔				
Second-year / First-semester	En Ee Fm 2 20 4	Fluid Mechanics I	Basic	✔		✔		✔	✔	✔	✔				
Second-year / First-semester	En Ee Ep 2 21 5	Environmental Protection I	Basic		✔	✔	✔	✔			✔	✔	✔	✔	✔
Second-year / First-semester	En Ee Es 2 22 6	Engineering Surveying I	Basic	✔		✔		✔			✔				
Second-year / First-semester	En Ee Bm 2 23 7	Building Materials	Basic					✔					✔		
Second-year / First-semester	En Ee EL 2 24 8	English Language III	Basic		✔		✔					✔		✔	
Second year / Second semester	En Ee Ma 2 25 9	Mathematics IV	Basic	✔		✔					✔				
Second year / Second semester	En Ee Sm 2 26 10	Strength of Materials II	Basic	✔		✔		✔		✔	✔				
Second year / Second semester	En Ee Fm 2 27 11	Fluid Mechanics II	Basic	✔		✔		✔		✔	✔				
Second year / Second semester	En Ee Ep 2 28 12	Environmental Protection II	Basic		✔	✔	✔	✔			✔	✔	✔	✔	✔
Second year / Second semester	En Ee Es 2 29 13	Engineering Surveying II	Basic	✔		✔		✔		✔	✔				
Second year / Second semester	En Ee Es 2 30 14	Engineering Statistics	Basic	✔		✔		✔			✔				
Second year / Second semester	En Ee Bc 2 31 15	Building Construction	Basic	✔				✔			✔				
Second year / Second semester	En Ee EL 2 32 16	English Language IV	Basic					✔	✔				✔		
Third-year / First-semester	En Ee Ea 3 33 1	Engineering Analysis	Basic	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔
Third-year / First-semester	En Ee Dcc 3 34 2	Design of Concrete Construction	Basic	✔		✔		✔		✔	✔				
Third-year / First-semester	En Ee We 3 35 3	Water Engineering I	Basic	✔	✔	✔		✔	✔	✔	✔	✔	✔	✔	✔
Third-year / First-semester	En Ee Swm 3 36 4	Solid Waste Management	Basic		✔	✔	✔	✔			✔	✔	✔	✔	✔

Third-year / First-semester	En Ee Pd 3 37 5	Plumbing and Drainage I	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Third-year / First-semester	En Ee Em 3 38 6	Engineering Management	Basic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Third-year / First-semester	En Ee Spc 3 39 7	Soil Pollution Control	Basic		✓	✓	✓	✓			✓	✓	✓	✓	✓
Third-year / First-semester	En Ee EL 3 40 8	English Language V	Basic					✓	✓				✓		
Third-year / Second-semester	En Ee Nm 3 41 9	Numerical Methods	Basic	✓		✓					✓				
Third-year / Second-semester	En Ee Ts 3 42 10	Theory of Structures	Basic	✓		✓		✓		✓	✓				
Third-year / Second-semester	En Ee We 3 43 11	Water Engineering II	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Third-year / Second-semester	En Ee Hwm 3 44 12	Hazardous Waste Management	Basic		✓	✓	✓	✓			✓	✓	✓	✓	✓
Third-year / Second-semester	En Ee Pd 3 45 13	Plumbing and Drainage II	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Third-year / Second-semester	En Ee Ec 3 46 14	Engineering Economy	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Third-year / Second-semester	En Ee Eh 3 47 15	Engineering Hydrology	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Third-year / Second-semester	En Ee EL 3 28 16	English Language VI	Basic					✓	✓				✓		
Fourth year / First semester	En Ee Wre 4 49 1	Water Resources Engineering	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Fourth year / First semester	En Ee Apc 4 50 2	Air Pollution Control	Basic		✓	✓	✓	✓			✓	✓	✓	✓	✓
Fourth year / First semester	En Ee Wwe 4 51 3	Wastewater Engineering I	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Fourth year / First semester	En Ee Ipc 4 52 4	Industrial Pollution Control	Basic		✓	✓	✓	✓			✓	✓	✓	✓	✓
Fourth year / First semester	En Ee Dwdns 4 53 5	Design of Water Distribution Network Systems	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Fourth year / First semester	En Ee Ea 4 54 6	Environment and Architecture I	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Fourth year / First semester	En Ee Gp 4 55 7	Graduation Project	Basic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fourth year / First semester	En Ee EL 4 56 8	English Language VII	Basic					✓	✓				✓		
Fourth year / Second semester	En Ee Hse 4 57 9	Hydraulic Structures Engineering	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Fourth year / Second semester	En Ee Npc 4 58 10	Noise Pollution Control	Basic		✓	✓	✓	✓			✓	✓	✓	✓	✓
Fourth year / Second semester	En Ee Wwe 4 59 11	Wastewater Engineering II	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Fourth year / Second semester	En Ee En 4 60 12	Environmental Management	Basic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Fourth year / Second semester	En Ee Dwwcns 4 61 13	Design of Wastewater Collection Network Systems	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Fourth year / Second semester	En Ee Ea 4 62 14	Environment and Architecture II	Basic	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
Fourth year / Second semester	En Ee EL 4 63 15	English Language VIII	Basic					✓	✓				✓		
Fourth year / Second semester	En Ee Gp 4 55 7	Graduation Project	Basic	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Ministry of Higher Education
and Scientific Research
University of Babylon
College of Engineering
Department of Environmental Engineering

Course Description

for the B.Sc. in
Environmental Engineering Program

2025

The course includes all the elements, components, methods, attributes, and sources related to media economics.

THIRD STAGE - FIRST SEMESTER

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Engineering Analysis / En Ee Ea 3 33 1**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**60**
7. Semester / Year:	**First Semester / Third Year**
8. Date Description	**1/9/2024**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Four hours per week / Two Units**
11. Course administrator's name (mention all, if more than one name)	**Prof. Dr. Hussein A. M. Al-Zubaidi**
	Email: hussein.alzubaidi@uobabylon.edu.iq

12. Course objectives

1. **Solve First-Order Differential Equations:** To apply analytical methods for solving ordinary differential equations of the first order in engineering-related contexts.
2. **Apply Techniques for Linear Differential Equations:** To effectively solve ordinary linear differential equations with constant coefficients using standard solution methods for modeling physical systems.
3. **Analyze Systems of Differential Equations:** To formulate and solve **systems of differential equations** relevant to multi-variable engineering problems by applying matrix methods and eigenvalue techniques.
4. **Utilize Fourier Series and Integrals:** To represent periodic functions using **Fourier series and integrals** for use in signal processing, heat transfer, and vibration analysis.
5. **Solve Partial Differential Equations with Boundary Conditions:** To model and solve partial differential equations and boundary value problems common in engineering fields such as fluid dynamics and thermodynamics.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding of Differential Equations: Knowledge of first order and higher-order ordinary differential equations, including methods of solution and applications in engineering contexts.

A2. Comprehension of Systems and Boundary Value Problems: Understanding how to model and solve systems of differential equations and partial differential equations with boundary conditions.

A3. Familiarity with Fourier Analysis and Matrix Methods: Knowledge of Fourier series/integrals for function representation and the use of matrices and determinants in solving linear systems.

B- Subject-Specific Skills

B1. Solving Differential Equations: Ability to solve first-order and linear differential equations with constant coefficients relevant to engineering problems.

B2. Analyzing Systems of Equations and Boundary Value Problems: Skill in modeling and solving systems of ordinary and partial differential equations, including boundary value problems.

B3. Applying Fourier and Matrix Methods: Competence in using Fourier series/integrals and matrix operations (including determinants) for solving complex analytical problems.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **3. Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **3. Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	4 hours theoretical	An introduction to ordinary differential equations of the first order and the methods for solving them.	Ordinary differential equations of the first order	Theoretical lecture	Student participation, discussion + homework + oral exam
2	4 hours theoretical	Learn students how to solve ordinary differential equations of the first order.	Ordinary differential equations of the first order	=	=
3	4 hours theoretical	Students teach how to solve ordinary differential equations of the second order.	Ordinary linear differential equations with constant coefficients	=	=
4	4 hours theoretical	Learn students how to solve ordinary differential equations of the higher order.	Ordinary linear differential equations with constant coefficients	=	=
5	6 hours theoretical	An introduction to systems of differential equations and the solving methods	System of differential equations	=	=
6	4 hours theoretical	Students teach how to solve systems of differential equations. Learn how to solve systems of differential equations (continued)	System of differential equations	=	=
7	4 hours theoretical	Learn students how to approximate functions using the Fourier series	Fourier series and integral	=	=
8	4 hours theoretical	Learn students how to approximate functions using the Fourier series (continued)	Fourier series and integral	=	=
9	3 hours	**Measure students' understanding of the topics covered in Engineering Analysis.**	**Mid-term Exam (First semester)**		**Written examination**
10	3 hours theoretical	An introduction to Partial differential equations of their classes	Partial differential equations and boundary value problems	=	=
11	4 hours theoretical	An introduction to Partial differential equations and the solving methods	Partial differential equations and boundary value problems	=	=
12	4 hours theoretical	Learn students how to solve the Laplace, wave equation, and heat equation	Partial differential equations and boundary value problems	=	=
13	4 hours theoretical	Students learn how to solve the Laplace, wave equation, and heat equation (continued)	Partial differential equations and boundary value problems	=	=
14	6 hours theoretical	An Introduction to Determinants and Matrices Learn students how to use determinants and matrices analytically.	Determinant and matrices	=	=
15	3 hours	**Measure students' understanding of the topics covered in Engineering Analysis.**	**Final exam (First semester)**		**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	Erwin Kreyszig (2011). Advanced Engineering Mathematics. Tenth Edition, John Wiley & Sons, Inc. US
Main references (sources)	Wylie and Barrett (1996). Advanced Engineering Mathematics. Sixth Edition, McGraw-Hill, New York
Recommended books and references (scientific journals, reports...)	
Electronic references, websites	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Design of Concrete Construction/ En Ee Dcc 3 34 2**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**First Semester / Third Year**
8. Date Description	**1/9/2024**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours per week / Two Units**
11. Course administrator's name (mention all, if more than one name)	**Lecture Dr. Waleed Ali Hasan**
	Email: Eng.waleed.ali@uobabylon.edu.iq

12. Course objectives

1. **Understand the Properties of Concrete and Reinforcement Steel**
   To provide knowledge of material properties essential for structural design, including behavior under loading.
2. **Analyze and Design Reinforced Concrete Elements**
   To develop the ability to design beams (for flexure, shear, and torsion), slabs (one-way and two-way), and columns based on the ACI Code.
3. **Apply Design Principles to Slabs and Stairways**
   To design various slab systems (solid, ribbed) and staircases according to structural and architectural requirements.
4. **Ensure Structural Integrity through Detailing**
   To apply bond, anchorage, and cracking control requirements for safe and durable reinforced concrete structures.
5. **Integrate ACI Code Requirements in Design**
   To use the ACI Code provisions effectively in designing structural elements and ensuring code-compliant construction.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding Material Properties and Structural Behavior: Knowledge of concrete and steel reinforcement properties and how reinforced concrete behaves under various loading stages.

A2. Comprehension of Structural Element Design Principles: Understanding the design of beams (flexure, shear, torsion), slabs (one-way and two-way), and columns based on ACI Code provisions.

A3. Awareness of Detailing and Serviceability Requirements: Knowledge of bond and anchorage requirements, control of cracking, and design considerations for continuous beams and stairways.

B- Subject-Specific Skills

B1. Ability to Design Structural Elements According to ACI Code: Skill in designing reinforced concrete beams, slabs, columns, and stairways based on ACI standards and code requirements.

B2. Proficiency in Structural Analysis and Load Calculations: Ability to analyze flexure, shear, torsion, and combined loading in structural members and apply appropriate design methods.

B3. Competence in Detailing and Serviceability Considerations: Skill in implementing bonds, anchorage, cracking control, and reinforcement detailing for safe and durable concrete structures.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **3. Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **3. Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	An introduction to some theories and applications of concrete and steel reinforcement	Concrete and steel reinforcement properties	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	Understand the behavior of reinforced concrete at different loading stages.	Reinforced concrete behavior at different load stages	=	=
3	**3 hours theoretical**	Understand the mechanical behavior of reinforced concrete beams under flexural stresses.	Beam flexure design	=	=
4	**3 hours theoretical**	Learn the mechanical behavior of reinforced concrete beams under shear stresses.	Beam shear design	=	=
5	**3 hours theoretical**	Familiarize students with the requirements of the bond and anchorage.	Bond and anchorage requirements	=	=
6	**3 hours theoretical**	Understand the theories of concrete cracking.	Control of cracking	=	=
7	**3 hours theoretical**	Learn the mechanical behavior of reinforced concrete beams under torsional stresses.	Beam torsion design	=	=
8	**3 hours theoretical**	Learn how to analyze the continuous beams' shear and moment coefficient.	Continuous beams shear and moment coefficient	=	=
9	**3 hours theoretical**	Familiarize students with the analysis and design of a one-way solid slab	One-way solid slab design	=	=
10	**3 hours theoretical**	Familiarize students with the analysis and design of a one-way ribbed slab.	One-way ribbed slab design	=	=
11	**3 hours theoretical**	Familiarize students with the analysis and design of a Two-way solid slab	Two-way solid slab design	=	=
12	**3 hours theoretical**	Familiarize students with the analysis and design of a Two-way ribbed slab.	Two-way ribbed slab design	=	=
13	**3 hours theoretical**	Learn about the compression plus bending member.	Compression plus bending member design	=	=
14	**3 hours theoretical**	Familiarize students with column design.	Rectangular and circular column design and the ACI code requirement	=	=
15	**3 hours theoretical**	Familiarize students with the analysis and design of stairways.	Stairways design	=	=

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	▪ Design of concrete structures, by Winter and Nilson. ▪ Reinforced concrete structures by Park and Bowly. ▪ Building code requirements for structural concrete (ACI 318 M-19).
Main references (sources).	
Recommended books and references (scientific journals, reports...).	▪ Reinforced concrete fundamentals, by Ferguson. ▪ Design of concrete structures, by Nilson et al. ▪ Reinforced concrete structures, by Way and Solmor.
Electronic references, websites.	Building code requirements for structural concrete (ACI 318 M-19).

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Water Engineering I / En Ee We 3 35 3**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**75**
7. Semester / Year:	**First Semester / Third Year**
8. Date Description	**1/9/2024**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Five hours per week / Three units**
11. Course administrator's name (mention all, if more than one name)	**Prof. Dr. Amal Hamza Khalil** **Email: Amalhamza31@yahoo.com**

12. Course objectives

1. **Understand the fundamentals and objectives of water supply systems**, including system components, population forecasting, design period, and demand estimation.
2. **Analyze factors affecting water demand**, such as per capita usage, consumption variations, fire demand, and municipal water use components.
3. **Evaluate water quality parameters**, including physical, chemical, biological, and radiological characteristics, and their impact on public health and treatment.
4. **Apply principles of pump systems and hydraulics**, covering pump types, selection, efficiency, NPSH, cavitation, and mathematical modeling of head and power.
5. **Identify water sources and design intake structures**, considering groundwater/surface water, screening, aeration, and design criteria for efficient water intake systems.

6. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding Water Supply System Components and Objectives: Knowledge of the purpose, structure, and constituents of municipal water supply systems, including intakes, transmission, storage, and distribution.

A2. Comprehension of Water Demand and Population Forecasting: Understanding how to estimate population, design period, and calculate various types of water demand (domestic, commercial, fire, etc.), including factors affecting per capita consumption.

A3. Knowledge of Water Quality and Pumping Systems: Familiarity with the physical, chemical, biological, and radiological characteristics of water; and understanding the working principles, classification, and selection of pumps used in water supply systems.

B- Subject-Specific Skills

B1. Ability to Analyze and Design Water Supply System Components: Skill in calculating population forecasts, water demand, and designing system elements like intakes, screens, and pump stations based on engineering criteria.

B2. Proficiency in Pump System Design and Selection: Competence in applying hydraulic principles (e.g., total dynamic head, NPSH, efficiency) for selecting appropriate pumps and interpreting pump characteristic curves.

B3. Understanding and Evaluation of Water Quality Parameters: Skill in assessing physical, chemical, biological, and radiological characteristics of water to ensure suitability for municipal use.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

7. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

8. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

9. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **3. Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

10. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	3 hours theoretical + 2 hours practice		Introduction, Objectives of a water supply system,	Theoretical + practice lecture	Student participation, discussion + homework + oral exam
2	3 hours theoretical + 2 hours practice		Constituents of a water supply system, Population estimation, and forecasting	=	=
3	3 hours theoretical + 2 hours practice		Design period (the design life), population density, and Components of municipal water demand	=	=
4	3 hours theoretical + 2 hours practice		Factors affecting per capita demand, Variations in the rate of consumption,	=	=
5	3 hours theoretical + 2 hours practice		Fire demands quality of water supplies, and Physical characteristics of water.	=	=
6	3 hours theoretical + 2 hours practice		Chemical characteristics of water, biological characteristics of water, and Radiological aspects of water	=	=
7	3 hours theoretical + 2 hours practice	Measure students' understanding of the topics covered in Water Engineering.	**Mid-term Exam (First semester)**		**Written examination**
8	3 hours theoretical + 2 hours practice		General, Pump applications, Total dynamic head: Mathematical models and calculations	=	=
9	3 hours theoretical + 2 hours practice		Work power and efficiency, Net positive suction head (NPSH), Cavitation	=	=
10	3 hours theoretical + 2 hours practice		Classification of pumps, affinity laws of pumps, Specific speed, ns	=	=
11	3 hours theoretical + 2 hours practice		Pump selection, Pump characteristic curves	=	=
12	3 hours theoretical + 2 hours practice		General: Groundwater, Surface water	=	=
13	3 hours theoretical + 2 hours practice		Factors for source selection: Raw water intakes, screening, and aeration, Design elements	=	=
14	3 hours theoretical + 2 hours practice		Types of intakes: design criteria, Design considerations, Design of intakes and screens	=	=
15	3 hours theoretical + 2 hours practice	Measure students' understanding of the topics covered in Water Engineering.	**Final exam (First semester)**		**Written examination**

11. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Laboratory	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	50% (50)
Total assessment	100% (100 Marks)

12. Learning and teaching resources

Required textbooks, curricular books, if any.	Steel, E.W. and McGhee, T. J. Water Supply and Sewerage. McGraw-Hill LTD, (2007)
Main references (sources).	Syed R. Qasim, Edward M. Motley, Guang Z. Water Works Engineering Planning, Design & Operation.
Recommended books and references (scientific journals, reports...).	Mohammad A. M. Al-Tufaily. Water Engineering. University of Babylon
Electronic references, websites.	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Solid Waste Management / En Ee Swm 3 36 4**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**60**
7. Semester / Year:	**First Semester / Third Year**
8. Date Description	**1/9/2024**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Four hours per week / Three units**
11. Course administrator's name (mention all, if more than one name)	**Prof. Dr. Nabaa Shakir Hadi**
	Email: Nabaa.hadi@uobabylon.edu.iq

12. Course objectives

1. **To understand the definition, sources, and types of municipal solid waste.**
   Provide foundational knowledge about what constitutes solid waste and its classification based on origin and composition.
2. **To develop the ability to characterize and analyze solid waste.**
   Equip students with methods to determine the physical, chemical, and biological properties of municipal solid waste, including composition by weight and volume.
3. **To study the principles and systems of municipal solid waste management.**
   Introduce students to the components of an integrated waste management system, including generation, collection, transportation, treatment, and disposal.
4. **To explore methods for waste reduction and minimization.**
   Encourage understanding of techniques and strategies for source reduction, reuse, and sustainable waste handling practices.
5. **To examine recycling processes and their environmental benefits.**
   Analyze the role of recycling in waste management and its contribution to resource conservation and pollution reduction.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding the Nature and Composition of Municipal Solid Waste: Knowledge of the definition, types, and physical and chemical characteristics of municipal solid waste, including how to classify and quantify its components by weight or volume.

A2. Comprehension of Waste Collection and Management Systems: Understanding various methods of waste collection, storage, transportation, and the overall framework for municipal solid waste management.

A3. Awareness of Waste Reduction and Recycling Practices: Knowledge of strategies for reducing waste at the source, promoting recycling and reuse, and managing discards effectively to minimize environmental impact.

B- Subject-Specific Skills

B1. Ability to Characterize and Quantify Municipal Solid Waste: Skill in identifying and analyzing the components of solid waste through physical and chemical characterization methods.

B2. Proficiency in Designing Waste Collection and Management Systems: Competence in planning and evaluating waste collection, transport, and disposal systems based on population, waste generation rates, and local conditions.

B3. Skill in Applying Waste Reduction and Recycling Techniques: Ability to implement and assess source reduction strategies, material recovery processes, and recycling programs for effective solid waste management.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **3. Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**4 hours theoretical**	An introduction to some theories and applications of solid waste and its management methods.	Municipal solid waste is defined.	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**4 hours theoretical**	Knowledge of methods for characterizing municipal solid waste.	Methods of characterizing municipal solid waste.	=	=
3	**4 hours theoretical**	Identify the most essential materials by weight in municipal solid waste.	Materials in municipal solid waste by weight.	=	=
4	**4 hours theoretical**	Identify the most critical materials by weight in municipal solid waste.	Products in municipal solid waste by weight.	=	=
5	**4 hours theoretical**	Familiarize yourself with the methods of managing municipal solid waste.	Municipal solid waste management.	=	=
6	**4 hours theoretical**	Familiarize yourself with the methods of managing municipal solid waste.	Municipal solid waste management	=	=
7	**4 hours theoretical**	Disposal of municipal solid waste.	Discard of municipal solid waste.	=	=
8	**3 hours theoretical**	Measure students' understanding of the topics covered in Solid Waste Management.	**Mid-term Exam (First semester).**		**Written examination**
9	**4 hours theoretical**	Learn how to reduce the amount of solid waste.	Quantity reduction.	=	=
10	**4 hours theoretical**	Learn how to reduce the amount of solid waste.	Quantity reduction.	=	=
11	**6 hours theoretical**	Learn about municipal solid waste collection methods.	Collection of solid wastes.	=	=
12	**4 hours theoretical**	Learn about municipal solid waste collection methods.	Collection of solid wastes.	=	=
13	**4 hours theoretical**	Learn about municipal solid waste collection methods.	Collection of solid wastes.	=	=
14	**4 hours theoretical**	Learn how to recycle municipal solid waste.	Recycling.	=	=
15	**3 hours theoretical**	Measure students' understanding of the topics covered in Solid Waste Management.	**Final exam (First semester)**		**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	▪ Thomas H. Christensen, Solid Waste Technology & Management, Volume 1 & 2, 2010 ▪ Tchobanoglous, G., Theisen, H., Vigil, S. 1993. Integrated solid waste management: engineering principles and management issues. ▪ P.R. White, M. Franke, P. Hindle, Integrated Solid Waste Management: A Lifecycle Inventory: A Lifecycle Inventory.
Main references (sources).	
Recommended books and references (scientific journals, reports...).	Lecture
Electronic references, websites.	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Plumbing and Drainage I / En Ee Pd 3 37 5**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**First Semester / Third Year**
8. Date Description	**1/9/2024**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours per week / Two Units**
11. Course administrator's name (mention all, if more than one name)	**Asst. Prof. Intidhar Jabir Idan**
	Email: eng.intidhar.jabir@uobabylon.edu.iq

12. Course objectives

1. **To understand the fundamentals and history of plumbing systems.**
   Provide foundational knowledge of plumbing, including definitions, historical background, and evolution of water supply systems in buildings.
2. **To design and analyze water supply and distribution networks.**
   Develop the ability to plan and lay out efficient distribution systems, including cold and hot water networks, with proper pipe sizing and material selection.
3. **To apply design principles for water storage systems.**
   Equip students with the skills to design underground and elevated tanks, including knowledge of installation requirements and material specifications.
4. **To evaluate plumbing fixtures and sanitary appliances.**
   Introduce students to various plumbing fixtures (e.g., water closets, basins, showers) and the principles of functional and efficient bathroom design.
5. **To design fire protection systems and swimming pool plumbing.**
   Teach students the principles of fire sprinkler systems and basic swimming pool plumbing, including distribution requirements and system components.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding of Water Supply Systems and Distribution Networks: Knowledge of the components, layouts, and requirements for efficient water distribution systems in buildings, including cold and hot water networks.

A2. Knowledge of Water Storage Tank Design and Installation: Understanding different types of water storage tanks (underground, elevated), their design principles, material requirements, and installation considerations.

A3. Familiarity with Plumbing Fixtures and Fire Protection Systems: Comprehension of various plumbing fixtures, sanitary appliances, and the design and requirements of building fire protection sprinkler systems.

B- Subject-Specific Skills

B1. Ability to Design Water Supply and Distribution Networks: Skill in planning and calculating the layout, pipe sizing, and material selection for efficient cold and hot water distribution systems in buildings.

B2. Competence in Designing and Installing Water Storage Tanks: Proficiency in designing underground and elevated tanks, considering installation requirements, material specifications, and protection measures.

B3. Proficiency in Selecting and Installing Plumbing Fixtures and Fire Protection Systems: Capability to choose appropriate sanitary fixtures, fittings, valves, and design fire sprinkler systems according to building requirements and safety standards.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **3. Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**

3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	Learn terms about Plumbing	-Introduction, Plumbing history, and some definitions. Water supply and distribution system.	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	Learn about the methods of layout of the distribution network and the Requirements of a sound distribution system.	Layouts of the distribution Network. Requirements for a sound distribution system. Points that required consideration in designing the water supply system	=	=
3	**3 hours theoretical**	Study the Requirements relating to the installation and protection of water storage tanks.	Water storage tanks. Requirements relating to the installation and protection of water storage tanks. Requirements relating to materials used in water storage tanks	=	=
4	**3 hours theoretical**	The ability to design the Underground and Elevated roof tank	Designing an Underground tank. Designing an Elevated roof tank. Examples.	=	=
5	**3 hours theoretical**	Learn about the different types of Plumbing fixtures and appliances, Pipelines, and Materials used for water	Plumbing fixtures and appliances. Pipelines. Materials used for water pipes	=	=
6	**3 hours theoretical**	Learn about different types of connections, fittings, and valves	Types of connections. Fittings. Valves	=	=
7	**3 hours theoretical**	Study the different types of Sanitary Fixtures in a Building	Sanitary Fixtures in Building. Washbasins. Water closets. Showers	=	=
8	**3 hours theoretical**	Study the principles of good bathroom design	Principles of Good. Bathroom Design. Bathroom layout considerations	=	=
9	**3 hours theoretical**	Design the diameters of cold-water pipes for buildings	Design the cold-water network. Calculation of the diameters of water supply pipes.	=	=
10	**3 hours theoretical**	Design the diameters of cold-water pipes for buildings	Examples for designing the cold-water network	=	=
11	**3 hours theoretical**	Measure students' understanding of the topics covered in Solid Waste Management.	**Mid-term Exam (First semester).**		**Written examination**
12	**3 hours theoretical**	The ability to design the hot water network for buildings	Design the hot water network. Calculation of the hot water amount required for different types of buildings.	=	=
13	**3 hours theoretical**	Study the requirements relating to a sound hot water distribution system and storage water heaters (tank-type)	Requirements relating to a good Hot water distribution system. Storage water heaters (tank-type).	=	=
14	**3 hours theoretical**	Recognizing a Swimming pool The basic requirements for swimming pool construction	Swimming pools. Basic requirements in swimming pool construction. Open pools and covered pools	=	=
15	**3 hours theoretical**	Studying the Building's Fire Protection Systems	Building Fire Protection systems. Types of fire sprinklers. Requirements of an adequate distribution system for a fire sprinkler system.	=	=

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	
Main references (sources).	▪ Lecture ▪ Plumbing Engineering Design Handbook by ASPE, 2016. ▪ Plumbing Handbook, A guide to working with Water Corporation, ISBN 74043 565, 2014.
Recommended books and references (scientific journals, reports...).	Water distribution systems, edited by Dragan Savic and John Banyard, 2011
Electronic references, websites.	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Engineering Management / En Ee Em 3 38 6**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**First Semester / Third Year**
8. Date Description	**1/9/2024**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours per week / Two Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Ahmed Talib Sahib**
	Email: ahmed.auda@uobabylon.edu.iq

12. Course objectives

1. **To introduce the fundamentals of engineering management and decision-making tools.**
   Provide students with an understanding of core management principles and how they apply within engineering projects and organizations.
2. **To develop skills in formulating and solving optimization problems using Linear Programming.**
   Teach students how to model real-world problems using LP techniques, interpret graphical solutions, and determine optimal and feasible solutions.
3. **To analyze supply and demand scenarios for effective resource allocation.**
   Equip students with tools to evaluate production, supply chain, and market demand situations using quantitative methods.
4. **To apply break-even analysis for evaluating project feasibility and profitability.**
   Enable students to assess cost-volume-profit relationships and make informed financial decisions using break-even and profit/volume ratio concepts.
5. **To understand and apply project management techniques like PERT and CPM.**
   Provide students with practical knowledge in scheduling, managing, and analyzing projects using network analysis tools to identify critical paths and project timelines.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding the Principles of Engineering and Project Management: Comprehend the fundamentals of engineering management, including planning, organizing, and controlling engineering projects using tools like PERT and CPM.

A2. Knowledge of Linear Programming and Optimization Techniques: Understand the assumptions, formulation, and graphical solutions of linear programming problems, including feasible regions and optimal solutions.

A3. Familiarity with Plumbing Fixtures and Fire Protection Systems: Gain knowledge of break-even analysis, profit/volume ratios, and supply-demand analysis to support financial and operational decision-making in engineering contexts.

B- Subject-Specific Skills

B1. Formulating and Solving Linear Programming Problems: Ability to construct and analyze linear programming models, apply graphical optimization techniques, and identify feasible and optimal solutions.

B2. Utilizing Project Management Techniques (PERT & CPM): Competence in developing project schedules, identifying critical paths, and managing project timelines using PERT and Critical Path Method (CPM) tools.

B3. Applying Break-Even and Financial Analysis Tools: Skill in performing break-even analysis, profit/volume ratio calculations, and interpreting supply-demand data to support economic decision-making in engineering projects.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **3. Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**

3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	Engineering Management and Its Concern for the Environment.	Introduction to Engineering Management	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	What are the terms constrained optimization, linear programming, assumptions, Formulation, graphical solutions, optimal solutions, and feasible solution space?	Management: Graphical method of optimization	=	=
3	**3 hours theoretical**	Feasible solution space.	Linear Programming: Graphical interpretation of Linear Programming	=	=
4	**3 hours theoretical**	Optimal solution	Linear programming, assumptions, Formulation	=	=
5	**3 hours theoretical**	Optimal solution	graphical solutions, optimal solutions,	=	=
6	**3 hours theoretical**	feasible solution space.	Feasible solution space.	=	=
7	**3 hours theoretical**	Examples	Examples of Linear Programming	=	=
8	**3 hours theoretical**	Measure students' understanding of the topics covered in Engineering Management.	**Mid-term Exam (First semester).**		**Written examination**
9	**3 hours theoretical**	The point of intersection of the supply curve and the demand curve.	Supply and demand	=	=
10	**3 hours theoretical**	The point of intersection of the supply curve and the demand curve.	Supply and demand	=	=
11	**3 hours theoretical**	Break-even, Examples	Break-even analysis	=	=
12	**3 hours theoretical**	Useful for further analysis	Profit/Volume Ratio	=	=
13	**3 hours theoretical**	Project Evaluation and Review Technique	Net-Work Analysis Project Management: PERT (Project Evaluation and Review Technique)	=	=
14	**3 hours theoretical**	Selected the best Network	Net-Work Analysis: Critical Path Method (CPM)	=	=
15	**3 hours theoretical**	Measure students' understanding of the topics covered in Engineering Management.	**Final exam (First semester)**		**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	
Main references (sources).	1. John Dustin Kemper. 1993. Introduction to the Engineering Profession. Saunders College, USA. 2. Nigel, J. Smith. 2002. Engineering Project Management. Blackwell Science, UK. 3. Panneerselvam, R. and P. Senthilkumar. 2009. Project Management. PHI Learning Private Limited, New Delhi. 4. Panneerselvam, R, 2012. Engineering Economics. PHI Learning Private Limited, New Delhi. 5. Ricky W. Griffin. 2002. Management, Houghton Mifflin. Boston, USA. 6. William J. Stevenson and Ceyhun Ozgur. 2007. Introduction to Management Science with Spreadsheet, McGraw-Hill, New York, USA. 7. Wu, N., and R. Coppims. 1981. Linear programming and extensions. McGram, USA
Recommended books and references (scientific journals, reports...).	Water distribution systems, edited by Dragan Savic and John Banyard, 2011
Electronic references, websites.	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Soil Pollution Control / En Ee Spc 3 39 7**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**60**
7. Semester / Year:	**First Semester / Third Year**
8. Date Description	**1/9/2024**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Four hours per week / Three units**
11. Course administrator's name (mention all, if more than one name)	**Lec. Dr. Wathiq Jasim Al-Jabban**
	Email: Wathiq.aljabban@uobabylon.edu.iq

12. Course objectives

1. **To introduce the fundamentals of soil pollution and its environmental impact.**
   Understand the sources, types, and mechanisms of soil contamination and their effects on ecosystems and human health.
2. **To develop competency in soil sampling and pollution assessment techniques.**
   Learn and apply standard methods for soil sampling and use of technologies for analyzing pollutant levels and distribution.
3. **To explore and evaluate various soil remediation techniques.**
   Study and compare physical, chemical, biological, and integrated methods for cleaning contaminated soils.
4. **To understand regulatory frameworks and ethical considerations in soil pollution control.**
   Gain knowledge of environmental regulations and ethical responsibilities in managing and mitigating soil pollution.
5. **To strengthen problem-solving and communication skills through project-based learning.**
   Apply theoretical knowledge in real or simulated soil pollution scenarios through team projects, case studies, and effective reporting.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding the Types and Sources of Soil Pollutants: Comprehend the various categories of soil pollutants (organic, inorganic, biological), their origins, and how they interact with soil components.

A2. Knowledge of Soil Contamination Mechanisms and Assessment Methods: Understand how pollutants move and accumulate in soil systems and gain familiarity with sampling techniques and assessment technologies used to evaluate contamination levels.

A3. Awareness of Soil Remediation Techniques and Regulatory Frameworks: Learn the principles behind physical, chemical, and biological soil remediation methods, and understand the environmental laws and ethical guidelines governing soil pollution management.

B- Subject-Specific Skills

B1. Ability to Conduct Soil Sampling and Pollution Assessment: Apply appropriate soil sampling methods and use modern assessment technologies to identify and quantify soil contamination levels.

B2. Skill in Selecting and Implementing Soil Remediation Techniques: Evaluate site-specific conditions and apply suitable physical, chemical, or biological methods to remediate polluted soils effectively.

B3. Capacity to Analyze and Apply Environmental Regulations and Ethical Practices: Interpret relevant legal frameworks and incorporate ethical decision-making into the planning and execution of soil pollution management projects.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **3. Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**4 hours theoretical**	Understand soil pollution sources and pathways	Introduction to Soil Pollution	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**5 hours theoretical**	Identify types of soil pollutants and their behavior; Learn soil sampling techniques.	Types of Soil Pollutants, Soil Sampling Methods	=	=
3	**4 hours theoretical**	Analyze mechanisms of soil contamination	Soil Contamination Mechanisms	=	=
4	**4 hours theoretical**	Evaluate soil pollution assessment methods	Soil Pollution Assessment Technologies	=	=
5	**4 hours theoretical**	Examine soil pollution regulations and policies	Regulatory Frameworks for Soil Pollution	=	=
6	**4 hours theoretical**	Explore physical soil remediation techniques	Physical Soil Remediation Methods	=	=
7	**3 hours theoretical**	Measure students' understanding of the topics covered in Engineering Management.	**Mid-term Exam (First semester).**	**-**	**Written examination**
8	**4 hours theoretical**	Investigating chemical soil remediation methods	Chemical Soil Remediation Methods	=	=
9	**4 hours theoretical**	Understand biological soil remediation approaches	Biological Soil Remediation Techniques	=	=
10	**4 hours theoretical**	Analyze integrated soil remediation strategies	Integrated Soil Remediation Approaches	=	=
11	**4 hours theoretical**	Learn about emerging soil pollution issues	Emerging Soil Pollution Challenges	=	=
12	**4 hours theoretical**	Develop communication skills for stakeholder engagement	Communication in Soil Pollution Management	=	=
13	**4 hours theoretical**	Apply knowledge to real-world soil pollution scenarios	Soil Pollution Management Project	=	=
14	**5 hours theoretical**	Ethical considerations in soil pollution management. Reflect on course learnings and future applications	Ethics in Soil Pollution Treatment. Course Reflection and Future Directions	=	=
15	**3 hours theoretical**	Measure students' understanding of the topics covered in Engineering Management.	**Final Exam (First semester).**	**-**	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Laboratory	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	50% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	-
Main references (sources).	1. Principles of Soil Chemistry" by Kim H. Tan - Offers in-depth coverage of soil chemistry concepts essential for understanding soil pollution processes. 2. Environmental Soil Physics. Daniel Hillel - Focuses on the physical aspects of soil, including transport mechanisms of pollutants and remediation techniques. 3. Handbook of Soil Sciences: Properties and Processes. Pan Ming Huang, Yuncong Li, and Malcolm E. Sumner - Offers a comprehensive resource covering various aspects of soil science relevant to soil pollution and treatment. **4.** Introduction to Environmental Engineering. Mackenzie L. Davis and David A. Cornwell - Provides fundamental knowledge of environmental engineering principles and their application to soil pollution management.
Recommended books and references (scientific journals, reports...).	▪ Soil Pollution: Origin, Monitoring & Remediation. Abigail M. Judd ▪ Handbook of Soil Analysis: Mineralogical, Organic and Inorganic Methods. Marc Pansu and Jacques Gautheyrou ▪ Principles and Applications of Soil Microbiology. David M. Sylvia, Jeffry J. Fuhrmann, Peter G. Hartel, and David A. Zuberer. ▪ Soil Pollution and Soil Protection. Peter Buurman and Gerard D. Grootjans
Electronic references, websites.	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**English Language V / En Ee EL 3 40 8**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**30**
7. Semester / Year:	**First Semester / Third Year**
8. Date Description	**1/9/2024**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Two hours per week / One unit**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Asst. Lec. Noor Ahmed**
	Email:

12. Course objectives

1. **This course emphasizes the fundamental language skills of reading, writing, speaking, listening, thinking, viewing, and presenting.**
2. **An emphasis on vocabulary and composition skills will be an ongoing part of the program.**
3. **Developing grammatically correct sentences in different tenses is a significant emphasis of the course.**

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding of the Core Language Skills: Gain foundational knowledge of the four main language skills: reading, writing, speaking, and listening, along with integrated skills like thinking, viewing, and presenting.

A2. Awareness of Grammar and Sentence Structure: Understand the rules of English grammar, including sentence construction and correct usage of different verb tenses.

A3. Knowledge of Vocabulary Development and Composition: Build a strong vocabulary base and understand principles of paragraph and essay writing to express ideas clearly and effectively.

B- Subject-Specific Skills

B1. Ability to Communicate Effectively in Spoken and Written English: Develop clear and coherent speech and writing, with correct grammar, appropriate vocabulary, and proper sentence structure across various tenses.

B2. Competence in Comprehending and Analyzing Written and Spoken Texts: Strengthen reading and listening skills to understand, interpret, and critically engage with a range of texts and spoken materials.

B3. Skill in Constructing Grammatically Correct Sentences Across Tenses: Apply knowledge of English grammar to form accurate sentences in different tenses, enhancing both writing and speaking clarity.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
Week 1	**2 hours theoretical**		Present simple	Theoretical lecture	Student participation, discussion + homework + oral exam
Week 2	**2 hours theoretical**		Present simple	=	=
Week 3	**2 hours theoretical**		Present simple	=	=
Week 4	**2 hours theoretical**		Past Tense	=	=
Week 5	**2 hours theoretical**		Past Tense	=	=
Week 6	**2 hours theoretical**		Past Tense	=	=
Week 7	**2 hours theoretical**	**Measure students' understanding of the topics covered in English Language.**	**Mid-term Exam (First semester).**	**-**	**Written examination**
Week 8	**2 hours theoretical**		Modal Verbs	=	=
Week 9	**2 hours theoretical**		Modal Verbs	=	=
Week 10	**2 hours theoretical**		Modal Verbs	=	=
Week 11	**2 hours theoretical**		Modal Verbs	=	=
Week 12	**2 hours theoretical**		Future Forms	=	=
Week 13	**2 hours theoretical**		Future Forms	=	=
Week 14	**1 hour theoretical**		Future Forms	=	=
Week 15	**3 hours theoretical**	**Measure students' understanding of the topics covered in English Language.**	**Final exam (First semester)**		**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	
Main references (sources).	
Recommended books and references (scientific journals, reports...).	
Electronic references, websites.	▪ Websites

SECOND SEMESTER

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Numerical Methods / En Ee Nm 3 41 9**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**60**
7. Semester / Year:	**Second Semester / Third Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Four hours per week / Two units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Prof. Dr. Hussein A. M. Al-Zubaidi**
	Email: hussein.alzubaidi@uobabylon.edu.iq

12. Course objectives

1. **To understand and apply curve fitting techniques.**
   Introduce students to interpolation and regression methods for modeling data using best-fit curves.
2. **To develop skills in numerical differentiation and integration.**
   Learn and apply standard methods for soil sampling and use of technologies for analyzing pollutant levels and distribution.
3. **To solve nonlinear and linear algebraic equations numerically.**
   Provide techniques such as the bisection method, Newton-Raphson method, and matrix-based solutions for systems of equations.
4. **To analyze and solve ordinary differential equations (ODEs).**
   Apply numerical methods like Euler's method and Runge-Kutta techniques for solving both initial and boundary value problems.
5. **To introduce the basics of finite difference and finite element methods.**
   Enable students to solve partial differential equations numerically using discretization techniques for engineering and scientific problems.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding of Curve Fitting and Data Approximation Techniques: Comprehend the principles of interpolation and regression used to fit curves to data for modeling and prediction.

A2. Knowledge of Numerical Methods for Solving Equations and Calculus Problems: Understand numerical techniques for root-finding, numerical differentiation, and integration when analytical solutions are impractical.

A3. Familiarity with Numerical Solutions of Differential Equations: Gain insight into solving ordinary and partial differential equations using methods like Euler's method, Runge-Kutta, finite difference, and finite element techniques.

B- Subject-Specific Skills

B1. Apply numerical techniques to solve nonlinear and linear algebraic equations: Use methods such as the bisection method, Newton-Raphson, and matrix-based solutions to solve real-world mathematical problems.

B2. Implement numerical differentiation and integration methods: Calculate derivatives and definite integrals using numerical approaches like trapezoidal and Simpson's rules in the absence of exact solutions.

B3. Solve ordinary and partial differential equations using numerical methods: Apply techniques such as Euler's method, Runge-Kutta, finite difference, and finite element methods to initial and boundary value problems in engineering and science.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**

4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**4 hours theoretical**	Learn how to fit students using different methods numerically	Curve fitting	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**4 hours theoretical**	Learn students how to fit data using different methods numerically	Curve fitting (continued)	=	=
3	**4 hours theoretical**	Students learn how to differentiate and integrate tabular data and functions numerically.	Numerical differentiation and integration	=	=
4	**4 hours theoretical**	Learn students how to integrate tabular data and functions numerically	Numerical integration (continued)	=	=
5	**4 hours theoretical**	Learn students how to solve nonlinear equations numerically	Nonlinear equations roots	=	=
6	**4 hours theoretical**	Students learn how to solve linear algebraic equations numerically	Linear algebraic equations: numerical solution	=	=
7	**6 hours theoretical**	Learn how to solve ordinary differential equations numerically - Initial value problems	Numerical solution of ordinary differential equations - Initial value problems	=	=
8	**2 hours theoretical**	**Measure students' understanding of the topics covered in English Language.**	**Mid-term Exam (Second semester).**	**-**	**Written examination**
9	**4 hours theoretical**	Students learn how to solve the system of ordinary differential equations numerically.	Numerical solution of ordinary differential equations - Initial value problems (continued) + system of equations	=	=
10	**4 hours theoretical**	An introduction to finite difference methods	Finite differences	=	=
11	**5 hours theoretical**	Learn how to solve ordinary differential equations numerically - Boundary value problems	Numerical solution of ordinary differential equations - Boundary value problems	=	=
12	**4 hours theoretical**	Students learn how to solve partial differential equations numerically	Numerical solution of partial differential equations	=	=
13	**4 hours theoretical**	Students learn how to solve partial differential equations numerically	Numerical solution of partial differential equations (continued)	=	=
14	**4 hours theoretical**	An introduction to finite element methods	Finite element	=	=
15	**3 hours theoretical**	**Measure students' understanding of the topics covered in English Language.**	**Final Exam (Second semester).**	**-**	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	Erwin Kreyszig (2011). Advanced Engineering Mathematics. Tenth Edition, John Wiley & Sons, Inc. US
Main references (sources).	Wylie and Barrett (1996). Advanced Engineering Mathematics. Sixth Edition, McGraw-Hill, New York
Recommended books and references (scientific journals, reports...).	
Electronic references, websites.	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Theory of Structures / En Ee Ts 3 42 10**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**Second Semester / Third Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours per week / Two units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Lec. Dr. Waleed Ali Hasan**
	Email: Eng.waleed.ali@uobabylon.edu.iq

12. Course objectives

6. **To understand the behavior of structural elements under various types of loads.**
   Introduce students to the concepts of loads, forces, stability, and equilibrium in structural systems.
7. **To analyze internal forces in beams and trusses.**
   Teach students how to draw and interpret axial force, shear force, and bending moment diagrams for different structural elements.
8. **To develop the ability to analyze statically determinate and indeterminate structures.**
   Provide techniques for solving statically determinate trusses and introduce approximate and numerical methods for statically indeterminate structures.
9. **To apply influence line methods for moving loads.**
   Enable students to construct and use influence lines for analyzing the effects of live moving loads on statically determinate structures.
10. **To introduce methods for structural analysis using classical approaches.**
    Cover classical methods such as the moment distribution method and unit load method to analyze beams, trusses, and multi-story frames.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding Types of Loads and Structural Stability: Comprehend the nature of different loads (dead, live, wind, etc.), internal forces, and the principles of equilibrium, stability, and support conditions in structural systems.

A2. Knowledge of Structural Analysis for Determinate Systems: Understand how to construct and interpret diagrams of axial forces, shear forces, and bending moments in beams and trusses, and apply methods for analyzing statically determinate structures.

A3. Familiarity with Influence Lines and Load Effects: Grasp the concept of influence lines for statically determinate structures and trusses and apply them to determine maximum shear forces and bending moments under moving loads.

B- Subject-Specific Skills

B1. Ability to Analyze Structural Elements Under Loads: Apply methods to determine axial forces, shear forces, and bending moments in beams, trusses, and frames under various loading conditions.

B2. Proficiency in Constructing and Interpreting Influence Lines: Develop influence lines for statically determined structures to evaluate the effects of moving loads and identify critical design forces.

B3. Capability to Perform Approximate and Classical Analysis of Indeterminate Structures: Use methods like the moment distribution method and unit load method to analyze statically indeterminate structures such as portal frames and multi-story buildings.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	An introduction to some theories and applications of structural analysis	Types of loads, forces, stability, and balance of installations	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	Learn how to draw diagrams of axial forces, shear, and bending	Diagrams of axial forces, shear, and bending	=	=
3	**3 hours theoretical**	Understand the mechanical behavior of ground beam systems	Ground beam systems	=	=
4	**4 hours theoretical**	Learn the analysis of statically defined trusses and familiarize students with the influence line.	Types of trusses and analysis of statically defined trusses, influence line for statically defined structures	=	=
5	**3 hours theoretical**	Understand the theories of the line of Influence for statically defined structures and trusses.	Line of influence for statically defined structures and trusses	=	=
6	**3 hours theoretical**	Learn the effects of moving loads on statically defined installations	A series of live moving loads on statically defined installations	=	=
7	**3 hours theoretical**	Learn how to determine the absolute value of the maximum shear force and the maximum bending moment.	The absolute value of the maximum shear force and the maximum bending moment	=	=
8	**2 hours theoretical**	**Measure students' understanding of the topics covered in English Language.**	**Mid-term Exam (Second semester).**	**-**	**Written examination**
9	**3 hours theoretical**	Familiarize students with approximate analysis methods for statically indeterminate trusses.	Approximate analysis methods for statically indeterminate trusses	=	=
10	**3 hours theoretical**	Familiarize students with methods for approximate analysis of portal structures.	Methods for approximate analysis of portal structures	=	=
11	**3 hours theoretical**	Familiarize students with methods of approximate analysis of multi-story structures.	Methods of approximate analysis of multi-story structures	=	=
12	**3 hours theoretical**	Familiarize students with statically defined thresholds" by the one-unit convection method.	Precipitation at statically defined thresholds" by the one-unit convection method	=	=
13	**3 hours theoretical**	Familiarize students with statically defined trusses" by the one-unit convection method.	Precipitation in statically defined trusses" by the one-unit convection method	=	=
14	**3 hours theoretical**	Familiarize students with statically indeterminate thresholds by the moment distribution method.	Analysis of statically indeterminate thresholds by the moment distribution method	=	=
15	**3 hours theoretical**	**Measure students' understanding of the topics covered in English Language.**	**Final Exam (Second semester).**	**-**	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	1. Elements of Structural Mechanics by NC Sinha & SK Sen Gupta. 2. Structural Analysis by RC Hibbeler.
Main references (sources).	Structural Analysis by RC Hibbeler
Recommended books and references (scientific journals, reports...).	
Electronic references, websites.	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Water Engineering II / En Ee We 3 43 11**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**75**
7. Semester / Year:	**Second Semester / Third Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Five hours per week / Three units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Prof. Dr. Amal Hamza Khalil**
	Email: Amalhamza31@yahoo.com

12. Course objectives

1. **Understand the fundamental principles of water treatment processes:** Introduce students to key processes such as coagulation, flocculation, sedimentation, filtration, and disinfection in water treatment systems.
2. **Analyze physical and chemical treatment mechanisms:** Enable students to apply gravity separation theory, discrete particle settling, and chlorine demand principles in designing and evaluating treatment units.
3. **Design and evaluate sedimentation and filtration units:** Provide students with the skills to analyze the performance and efficiency of sedimentation basins and filtration through porous media.
4. **Understand disinfection and sterilization techniques in water treatment:** Teach the role of various disinfectants (e.g., chlorine), and how to assess their effectiveness using concepts like the chlorine demand curve.
5. **Evaluate sludge formation and management in treatment systems:** Cover classical methods such as the moment distribution method and unit load method to analyze beams, trusses, and multi-story frames.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding of Coagulation and Flocculation Processes: Comprehend the chemical and physical mechanisms behind coagulation and flocculation in water treatment, including the role of coagulants in removing suspended solids.

A2. Knowledge of Sedimentation and Filtration Principles: Understand gravity separation theory, idealized discrete particle settling, and flow through porous media for efficient design and operation of sedimentation basins and filtration units.

A3. Familiarity with Disinfection Methods and Chlorine Demand: Gain insight into water disinfection and sterilization methods, with emphasis on chlorine dosing, the chlorine demand curve, and their impact on public health and water quality.

B- Subject-Specific Skills

B1. Apply Design Principles to Water Treatment Units: Ability to design and evaluate components such as sedimentation basins, filtration systems, and flocculation tanks using gravity separation and particle settling theories.

B2. Analyze and Interpret Water Quality Treatment Data: Skill in interpreting chlorine demand curves, assessing disinfection effectiveness, and optimizing coagulant dosage based on raw water characteristics.

B3. Operate and Troubleshoot Water Treatment Processes: Practical capability to manage sludge zones, control filtration rates, and monitor disinfection systems to ensure safe and efficient water treatment operations.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	3 hours theoretical + 2 hours practice	General, Water Coagulation, Suspended Solids, Characteristics of Colloids, Zeta Potential, Coagulants, Rapid Mix (Flash Mix), Power Requirements, Mixer Power, Design Limitations.	Coagulation	Theoretical + practice lecture	Student participation, discussion + homework + oral exam
1+3	3 hours theoretical + 2 hours practice	General, Types of Flocculation, Design Criteria for Flocculation Basins, Flocculation Basin, Baffle Wall, Power Imparted, and Velocity Gradient of Flocculation Basin.	Flocculation	=	=
4+5	3 hours theoretical + 2 hours practice	General, Particle Discrete Settling Theory (Type 1 Settling), Settling in the Laminar Region. Settling in the Transition Region, Settling in the Turbulent Region.	Water Treatment (Gravity Separation Theory)	=	=
6	5 hours theoretical + 2 hours practice	Flocculant Particle Settling (Type 2 Settling), Hindered (Zone) Settling (Type 3 Settling), Area Requirement Based on Single-Batch – Batch Test Results, Compression Settling (Type 4 Settling).	Idealized Discrete Particle Settling	=	=
7	5 hours	**Measure students' understanding of the topics covered in Water Engineering.**	**Mid-term Exam (Second semester).**	-	**Written examination**
8+9	3 hours theoretical + 2 hours practice	General, Sedimentation Basins Design, Pre-sedimentation Facilities, Rectangular Sedimentation Basins, Inlet Structure, Outlet Structure.	Water Treatment (Sedimentation Basins)	=	=
10+11	3 hours theoretical + 2 hours practice	Horizontal Flow Velocity, Circular Sedimentation basins and Upflow Clarifiers, Tube and Lamella Plate Clarifiers, Process Configuration.	Sludge Zone	=	=
12	5 hours theoretical + 2 hours practice	General, Filtration Mechanisms, Filter Media, Types of Filters, Principles of Slow Sand Filters (Ssf), Principles of Multimedia Filter (Mixed Bed Filter), Principles of Rapid Sand Filter (Gravity Filter) (Rsf)	Water Treatment (Water Filtration Flow Through Porous Media)	=	=
13	3 hours theoretical + 2 hours practice	○ General, Media, Physical Methods of Disinfection: ○ Chemical Methods of Disinfection: ○ Chlorination ○ Chlorine-Based Alternative Disinfectants ○ Non-Chlorine Alternative Disinfectants	Water Treatment (Disinfection and Sterilization)	=	=
14	3 hours theoretical + 2 hours practice	**Chlorine Demand Curve** ○ Disinfection Kinetics, Log Inactivation, Concept, Ct, Formulation, Ct, and Log Inactivation Calculation Overview, Factors Influencing Disinfection	Chlorine Demand Curve	=	=
15	5 hours	**Measure students' understanding of the topics covered in Water Engineering.**	**Final Exam (Second semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Laboratory	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	50% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	Steel, E.W. and McGhee, T. J. Water Supply and Sewerage. McGraw-Hill LTD, (2007)
Main references (sources).	Syed R. Qasim, Edward M. Motley, Guang Z. Water Works Engineering Planning, Design & Operation.
Recommended books and references (scientific journals, reports...).	Mohammad A. M. Al-Tufaily. Water Engineering. University of Babylon
Electronic references, websites.	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Hazardous Waste Management / En Ee Hwm 3 44 12**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**60**
7. Semester / Year:	**Second Semester / Third Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Five hours per week / Three units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Prof. Dr. Nabaa Shakir Hadi**
	Email: Nabaa.hadi@uobabylon.edu.iq

12. Course objectives

1. **Understand the fundamentals of hazardous waste management,** including definitions, regulatory frameworks, and the importance of proper handling to protect health and the environment.
2. **Identify and classify hazardous waste** based on physical and chemical characteristics, regulatory criteria, and industry-specific standards.
3. **Apply safe practices for the storage, transportation, and documentation** of hazardous waste in compliance with national and international regulations.
4. **Evaluate treatment, minimization, and remediation technologies** for hazardous waste, with an emphasis on sustainable and cost-effective solutions.
5. **Analyze current best practices, emerging trends, and ethical considerations** in hazardous waste management from both local and global perspectives.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Apply Knowledge of Waste Classification and Regulations: Understanding hazardous waste identification and legal frameworks to support environmentally responsible architectural and infrastructure designs.

A2. Integrate Safe Storage and Transportation Concepts: Knowledge to implement proper hazardous waste storage and transport systems within project plans that comply with safety and regulatory requirements.

A3. Incorporate Sustainable Waste Treatment and Minimization Strategies: Understanding treatment technologies and source reduction to guide environmentally sustainable architectural and engineering solutions.

B- Subject-Specific Skills

B1. Identify and Classify Hazardous Waste Materials: Ability to accurately assess and categorize hazardous waste based on physical, chemical, and regulatory criteria for safe handling and disposal.

B2. Design and Implement Safe Storage and Transport Systems: Skill to develop and apply appropriate storage and transportation procedures in compliance with environmental and safety regulations.

B3. Apply Waste Treatment and Minimization Techniques: Ability to select and utilize suitable treatment technologies and source reduction strategies to manage hazardous waste effectively and sustainably.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**4 hours theoretical**	Learn about the Definition and classification of hazardous waste	Introduction to Hazardous Waste Management	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**4 hours theoretical**	▪ Identification methods and criteria for hazardous waste. Characterization of dangerous waste properties. Hazardous waste sampling and analysis techniques	Hazardous Waste Identification	=	=
3	**4 hours theoretical**	▪ Storage requirements and guidelines for hazardous waste. Container selection and labelling. Storage area design and management	Hazardous Waste Storage	=	=
4	**4 hours theoretical**	▪ Transportation regulations and permits. Packaging, labelling, and marking of hazardous waste for transport. Documentation and record-keeping during transportation.	Hazardous Waste Transportation	=	=
5	**4 hours theoretical**	▪ Overview of treatment options (physical, chemical, biological). Incineration, landfilling, and other disposal methods. Treatment process selection and considerations.	Hazardous Waste. Treatment Technologies.	=	=
6	**4 hours theoretical**	Waste minimization strategies. ▪ Pollution prevention techniques. Recycling and reuse options for hazardous waste	Hazardous Waste Minimization and Source Reduction.	=	=
7	**4 hours**	**Measure students' understanding of the topics covered in Hazardous Waste Management.**	**Mid-term Exam (Second semester).**	-	**Written examination**
8	**4 hours theoretical**	Hazardous Waste Site Investigation and Remediation. ▪ Site assessment and characterization. Remediation technologies (e.g., excavation, soil vapor extraction). Long-term monitoring and site closure	Hazardous Waste Site Investigation and Remediation.	=	=
9	**4 hours theoretical**	Manifest system and regulatory paperwork. ▪ Record-keeping and reporting requirements. Compliance monitoring and audits	Hazardous Waste Management Documentation.	=	=
10	**4 hours theoretical**	Hazardous Waste Management for Specific Industries. ▪ Sector-specific hazardous waste management challenges. Case studies and examples from industries (e.g., manufacturing, healthcare).	Hazardous Waste. Management for Specific Industries.	=	=
11	**4 hours theoretical**	▪ Good practices for handling, storage, and disposal. Safety protocols and personal protective equipment (PPE). Training and education programs for waste management personnel.	Hazardous Waste. Management Best Practices.	=	=
12	**4 hours theoretical**	▪ Global agreements and conventions related to hazardous waste. International regulations and best practices. Cross-border movement of hazardous waste	International Perspectives on Hazardous Waste Management.	=	=
13	**4 hours theoretical**	▪ Ethical considerations in hazardous waste management. Approaches for sustainable waste management. Circular economic concepts and waste-to-energy technologies.	Hazardous Waste Management Ethics and Sustainability.	=	=
14	**6 hours theoretical**	▪ Breakthroughs in waste treatment and disposal methods. How nanotechnology is applied to waste management. New developments in monitoring and analysis techniques. Review and assessment of key concepts. A summary of major topics and concepts. Examination of real-world case studies and examples. A final assessment or project presentation.	Emerging Trends and Technologies in Hazardous Waste Management. Review and Assessment.	=	=
15	**3 hours**	**Measure students' understanding of the topics covered in Hazardous Waste Management.**	**Final Exam (Second semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	Hazardous Waste Management: An Introduction. VanGuilder, Michael V. Russo, and G. Wayne Miller
Main references (sources).	Hazardous Waste Management: Reducing the Risk. Ronald E. Hester and Roy M. Harrison
Recommended books and references (scientific journals, reports...).	Introduction to Environmental Engineering and Science. Gilbert M. Masters and Wendell P. Ela: The textbook provides a solid foundation in environmental engineering principles and concepts, including waste management.
Electronic references, websites.	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Plumbing and Drainage II / En Ee Pd 3 45 13**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**Second Semester / Third Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours per week / Two Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Asst. Prof. Intidhar Jabir Idan**
	Email: eng.intidhar.jabir@uobabylon.edu.iq

12. Course objectives

1. **Introduce the types and components of sewerage systems:** Provide foundational knowledge on separate, combined, and partially separate systems, and their suitability for various urban and building settings.
2. **Familiarize students with building sanitary systems:** Understand the types of hygienic pipes, joints, and underground protection methods used in building drainage networks.
3. **Teach proper design principles for internal sanitary networks:** Equip students to design internal drainage systems (e.g., One-Pipe, Two-Pipe, Single Stack) and apply correct ventilation practices.
4. **Develop competency in external drainage system planning:** Enable students to design external networks, including inspection rooms (manholes), with practical examples and sizing calculations.
5. **Analyze and design stormwater drainage systems:** Teach students how to calculate and design drainage systems for flat and sloped roofs, ensuring effective stormwater management.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Comprehensive Understanding of Sewerage System Types: Understand the principles, advantages, and applications of the different sewerage systems: Separate, Combined, and Partially Separate systems, and how they affect building and urban drainage design.

A2. Fundamentals of Sanitary Plumbing in Buildings: Gain knowledge of the types of pipes, joints, and connections used in sanitary drainage systems, including requirements for underground pipe protection and the structure of house drainage and ventilation systems.

A3. Drainage Network Design and Hydraulic Calculations: Understand the design principles of internal and external sanitary and stormwater drainage systems, including manhole placement, pipe sizing, and flow calculations for flat and sloped roof systems.

B- Subject-Specific Skills

B1. Design and Calculation of Sanitary and Stormwater Drainage Systems: Ability to design internal and external drainage networks and accurately calculate pipe diameters for both sanitary and stormwater systems in various roof conditions.

B2. Application of Sewerage System Types in Practical Scenarios: Skill in selecting and applying appropriate sewerage system types (separate, combined, partially separate) based on project requirements and site conditions.

B3. Implementation of Plumbing Layouts and Ventilation Systems: Proficiency in designing and implementing various sanitary pipe layouts (e.g., one-pipe, two-pipe, single-stack systems) and ensuring proper ventilation for effective wastewater flow and odor control.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	Studying the types of Sewerage Systems.	Types of sewerage systems: separate system, combined system, and partially separate system.	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	Learn about the sanitary works in building.	Sanitary Works in Building: Types of pipes used in sanitary drainage.	=	=
3	**3 hours theoretical**	Study the Joints and Connections for sanitary pipes.	Joints and Connections for Sanitary Pipes.	=	=
4	**3 hours theoretical**	Learn how to protect the underground pipes used in sewers inside buildings.	Protection of underground pipes used in sewers inside buildings.	=	=
5	**3 hours theoretical**	Learn about the main components of the house drainage system. Learning about ventilation systems.	House drainage system. Ventilation systems.	=	=
6	**3 hours theoretical**	Review the terms and conditions essential for designing and installing sewer lines.	Terms and conditions that must be considered in the design and implementation of sewer lines.	=	=
7	**3 hours**	**Measure students' understanding of the topics covered in Plumbing and Drainage.**	**Mid-term Exam (Second semester).**	**-**	**Written examination**
8	**3 hours theoretical**	Network design for the interior sanitary pipe system.	Network design for the interior sanitary pipe system: One-Pipe System, Two-Pipe System.	=	=
9	**3 hours theoretical**	Network design for the interior sanitary pipe system.	Fully Vented One-pipe System, Single Stack System, Modified single stack system.	=	=
10	**3 hours theoretical**	Network design for the external sanitary pipe system.	Network design for external sanitary pipe system: Inspection rooms (Manholes).	=	=
11	**3 hours theoretical**	Design the diameters of sanitary pipes for buildings.	Calculating the diameters of sanitary pipes with examples.	=	=
12	**3 hours theoretical**	Detection and receipt of sanitary work and studying stormwater drainage systems.	Methods of detection of sewage works, receiving hygienic works: stormwater drainage systems, Types of Stormwater drainage.	=	=
13	**3 hours theoretical**	Design the diameters of stormwater drainage pipes for horizontal roofs.	Calculating the diameters of stormwater drainage pipes for horizontal roofs with examples.	=	=
14	**3 hours theoretical**	Design the diameters of stormwater drainage pipes for sloping roofs.	Calculating the diameters of stormwater drainage pipes for sloping roofs.	=	=
15	**3 hours**	**Measure students' understanding of the topics covered in Plumbing and Drainage.**	**Final Exam (Second semester).**	**-**	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	-
Main references (sources).	▪ Lectures ▪ Plumbing Engineering Design Handbook by ASPE, 2016. ▪ Plumbing Handbook, A guide to working with Water Corporation, ISBN 74043 565, 2014.
Recommended books and references (scientific journals, reports...).	Water distribution systems. Dragan Savic and John Banyard, 2011
Electronic references, websites.	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Engineering Economy / En Ee Ec 3 46 14**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**Second Semester / Third Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours per week / Two Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Lec. Ahmed Talib Sahib**
	Email: ahmed.auda@uobabylon.edu.iq

12. Course objectives

1. **Understand the fundamentals of interest calculations:** Introduce concepts of simple and compound interest and their applications in engineering financial decisions.
2. **Apply engineering economic formulas to evaluate financial scenarios:** Utilize single and series payment models (e.g., present worth, future worth, sinking fund, capital recovery) for cost analysis.
3. **Teach proper design principles for internal sanitary networks:** Teach students to use present worth, future worth, annual worth, and rate of return methods for evaluating engineering projects.
4. **Develop skills in dealing with cash flow patterns:** Equip students with tools to evaluate uniform and gradient cash flows in engineering project assessments.
5. **Understand and calculate depreciation in engineering assets:** Introduce types of depreciation (e.g., straight-line, declining balance) and how they affect economic decision-making.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understand the principles of engineering economic analysis: Gain foundational knowledge of interest calculations, including simple and compound interest, and their role in evaluating project costs and returns.

A2. Recognize and apply time value of money concepts: Understand financial models such as present worth, future worth, annual worth, and capital recovery to assess different engineering alternatives.

A3. Comprehend depreciation methods and their economic impact: Learn various depreciation techniques (e.g., straight-line, declining balance) and how they influence asset valuation and investment decisions.

B- Subject-Specific Skills

B1. Apply interest formulas to solve engineering financial problems: Calculate simple and compound interest, present worth, future worth, and annuities using standard economic formulas.

B2. Evaluate and compare investment alternatives: Use present worth (PW), future worth (FW), annual worth (AW), and rate of return (ROR) methods to assess the economic feasibility of projects.

B3. Perform depreciation calculations for engineering assets: Implement various depreciation methods (e.g., straight-line, declining balance) to estimate asset value over time for economic decision-making.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	3 hours theoretical	Interest return analysis	Mathematics of interest: simple interest	Theoretical lecture	Student participation, discussion + homework + oral exam
2	3 hours theoretical	Interest return analysis	Mathematics of interest: compound interest	=	=
3	3 hours theoretical	Interest return analysis.	Interest Formulas and Their Applications Single-Payment Compound Amount	=	=
4	3 hours theoretical	Interest return analysis.	Single-Payment Present Worth Amount	=	=
5	3 hours theoretical	Interest return analysis	Equal-Payment Series Compound Amount	=	=
6	3 hours theoretical	Interest return analysis	Equal-Payment Series Sinking Fund. Equal-Payment Series Present Worth Amount	=	=
7	3 hours	**Measure students' understanding of the topics covered in Engineering Economy.**	**Mid-term Exam (Second semester).**	-	**Written examination**
8	3 hours theoretical	Interest return analysis	Equal-Payment Series Capital Recovery Amount	=	=
9	3 hours theoretical	Interest return analysis	Uniform Gradient Series Annual Equivalent Amount	=	=
10	3 hours theoretical	Project Alternatives. Selected the best project.	Bases for Comparison of Alternatives Present worth method (PW)	=	=
11	3 hours theoretical	Project Alternatives. Selected the best project.	Future worth method (FW) Annual worth method Rate of return	=	=
12	3 hours theoretical	Project Alternatives.	Bases for Comparison of Alternatives Annual worth method	=	=
13	3 hours theoretical	Selected the best project.	Bases for Comparison of Alternatives rate of return	=	=
14	3 hours theoretical	Physical assets are subject to the passage of time.	Depreciation methods (types &calculations)	=	=
15	3 hours theoretical	**Measure students' understanding of the topics covered in Engineering Economy.**	**Final Exam (Second semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	-
Main references (sources).	1. John Dustin Kemper. 1993. Introduction to the Engineering Profession. Saunders College, USA. 2. Nigel, J. Smith. 2002. Engineering Project Management. Blackwell Science, UK. 3. Panneerselvam, R. 2012. Engineering Economics. PHI Learning Private Limited, New Delhi. 4. Panneerselvam, R. and P. Senthilkumar. 2009. Project Management. PHI Learning Private Limited, New Delhi. 5. William J. Stevenson and Ceyhun Ozgur. 2007. Introduction to Management Science with Spreadsheets. McGraw-Hill, New York, USA.
Recommended books and references (scientific journals, reports...).	-
Electronic references, websites.	▪ Websites

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Engineering Hydrology / En Ee Eh 3 47 15**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**Second Semester / Third Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours per week / Two Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Prof. Rasha Salah Mahdi**
	Email: eng.rasha.salah@uobabylon.edu.iq

12. Course objectives

1. **Introduce students to the fundamental components of the hydrological cycle:** Precipitation, evaporation, transpiration, infiltration, and runoff.
2. **Enable students to analyze and interpret rainfall and runoff data:** Understanding hydrological processes and water resource planning.
3. **Develop the ability to estimate and evaluate infiltration, soil moisture, and percolation:** Assessing groundwater recharge and surface runoff generation.
4. **Provide knowledge and practical skills in hydrograph analysis,** including direct runoff and synthetic hydrographs to model watershed response.
5. **Equip students with techniques for flood routing and streamflow prediction:** Introducing hydraulic structure design and flood risk management.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understand the components of the hydrological cycle: Comprehend the processes of precipitation, evaporation, transpiration, infiltration, and runoff as part of the natural water cycle.

A2. Recognize the factors influencing surface and subsurface water movement: Understand how soil moisture, percolation, and infiltration affect groundwater recharge and runoff generation.

A3. Grasp the principles of hydrograph analysis and flood routing: Gain knowledge of direct runoff hydrographs, synthetic hydrographs, and methods used to model and predict streamflow and flooding behavior.

B- Subject-Specific Skills

B1. Analyze and interpret hydrological data: Apply techniques to measure, evaluate, and interpret precipitation, runoff, infiltration, and streamflow data.

B2. Develop and use hydrographs: Construct and analyze direct runoff hydrographs and synthetic hydrographs for watershed modeling and flood estimation.

B3. Apply hydrological methods for flood prediction and routing: Use flood routing techniques to simulate the movement of flood waves through rivers and reservoirs.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	The sequence of events through which water leaves the atmosphere, moves around the Earth, and returns to the atmosphere.	Introduction: the hydrological cycle	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	Precipitation is any liquid or frozen water that forms in the atmosphere and returns to the ground. It appears in many forms, such as rain, sleet, and snow. Along with evaporation and condensation, precipitation is one of the three main parts of the global water cycle.	Precipitation	=	=
3	**3 hours theoretical**	=	Precipitation	=	=
4	**3 hours theoretical**	=	Precipitation	=	=
5	**3 hours theoretical**	If the ground is covered with vegetation, it is hard to tell the difference between evaporation and transpiration. These two processes are linked and called evapotranspiration.	Evaporation (E) & Transpiration	=	=
6	**3 hours theoretical**	The movement of water through the soil surface into the soil	Infiltration, Soil Moisture, Percolation	=	=
7	**3 hours theoretical**	Runoff occurs when there is more water than the land can absorb. The excess liquid flows across the land's surface and into nearby creeks.	Runoff	=	=
8	**3 hours**	**Assess students' understanding of the topics covered in Engineering Hydrology.**	**Mid-term Exam (Second semester).**	**-**	**Written examination**
9	**3 hours theoretical**	Stage measurement; Discharge measurement	Stream flow	=	=
10	**3 hours theoretical**	The process of studying how water levels change over time involves analyzing hydrographs. This information helps in understanding and managing water flow in rivers, reservoirs, and other water bodies. By interpreting hydrographs, engineers and planners can make better decisions about where and how to use water resources.	Hydrograph Analysis	=	=
11	**3 hours theoretical**	It is a direct runoff hydrograph resulting from one unit (one inch or one centimeter) of constant intensity, uniform rainfall occurring over the entire watershed.	Direct Runoff Hydrograph	=	=
12	**3 hours theoretical**	To develop unit hydrographs for a catchment, detailed information about rainfall and the resulting flood hydrograph is required.	Synthetic hydrograph	=	=
13	**3 hours theoretical**	Flood routing is the technique used to determine the flood hydrograph at a river segment by using flood flow data from one or more upstream sections.	Flood Routing	=	=
14	**3 hours theoretical**	Flood routing is the method of determining the flood hydrograph at a river section by using flood flow data from one or more upstream sections.	Flood Routing	=	=
15	**3 hours theoretical**	**Assess students' comprehension of the topics covered in Engineering Hydrology.**	**Final Exam (Second semester).**	**-**	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	**"الهيدرولوجيا الهندسية". ترجمة د.نزار علي سبتي ود. لبيب خليل إسماعيل.** **"الهيدرولوجيا ومبادئ هندسة الري" د.محمد عبد الرحمن الجنابي وفاروق الفتياني**
Main references (sources).	○ **Linsley, R.K., M.A., Kohler & Paulhus, J.L. 1988. Hydrology for Engineers". McGraw-Hill, Singapore.** ○ **Wielson, E.M. 1983. Engineering Hydrology. MacMullan, London.** ○ **Ground Water Hydrology by Todd.**
Recommended books and references (scientific journals, reports...).	-
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**English Language VI / En Ee EL 3 28 16**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**30**
7. Semester / Year:	**Second Semester / Third Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Two hours per week / One Unit**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Asst. Prof. Dr. Wissam Al-Taliby**
	Email: Wissam.alwan@uobabylon.edu.iq

12. Course objectives

1. **Develop students' proficiency in the core language skills**: reading, writing, speaking, listening, thinking, viewing, and presenting.
2. **Enhance understanding and correct usage of English grammar**, mainly focusing on various tenses, including Present Perfect, Present Perfect Continuous, and all conditionals (Zero to Third).
3. **Improve students' ability to construct grammatically accurate and coherent sentences** using appropriate time expressions and structures.
4. **Expand vocabulary and composition skills** to enable effective communication in academic and everyday contexts.
5. **Encourage critical thinking and practical application of language skills** through interactive exercises, discussions, and written assignments.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding English Verb Tenses and Conditionals: Gain a solid grasp of Present Perfect, Present Perfect Continuous, and all four conditional forms (Zero, First, Second, and Third) to express time, condition, and result accurately.

A2. Comprehension of Time Expressions in Context: Recognize and correctly use time expressions (e.g., "since," "for," "already," "yet") in both spoken and written English to support proper tense usage.

A3. Familiarity with Core Language Skills: Develop foundational knowledge of reading, writing, listening, speaking, thinking, viewing, and presenting as essential components of effective communication.

B- Subject-Specific Skills

B1. Apply Grammatical Structures in Context: Accurately use Present Perfect, Present Perfect Continuous, and all forms of conditionals in spoken and written communication.

B2. Construct Grammatically Correct Sentences: Develop and express clear, well-structured sentences using appropriate tenses and time expressions.

B3. Demonstrate Proficiency in Core Language Skills: Effectively integrate reading, writing, speaking, and listening skills in academic and real-world scenarios.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**2 hours theoretical**		Present Perfect Tense	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**2 hours theoretical**		Present Perfect Tense	=	=
3	**2 hours theoretical**		Present Perfect Tense	=	=
4	**2 hours theoretical**		Present Perfect Continuous	=	=
5	**2 hours theoretical**		Present Perfect Continuous	=	=
6	**2 hours theoretical**		Present Perfect Continuous	=	=
7	**2 hours**	**Assess students' understanding of the topics covered in English Language.**	**Mid-term Exam (Second Semester).**	**-**	**Written examination**
8	**2 hours theoretical**		First conditional Zero conditional	=	=
9	**2 hours theoretical**		First conditional Zero conditional	=	=
10	**2 hours theoretical**		Second conditional	=	=
11	**2 hours theoretical**		Second conditional	=	=
12	**2 hours theoretical**		Third conditional	=	=
13	**2 hours theoretical**		Third conditional	=	=
14	**2 hours theoretical**		Time Expressions	=	=
15	**2 hours theoretical**	**Assess students' understanding of the topics covered in English Language.**	**Final Exam (Second Semester).**	**-**	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	60% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	
Main references (sources).	
Recommended books and references (scientific journals, reports...).	-
Electronic references, websites.	▪ **Websites**

Fourth stage - First semester

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Water Resources Engineering / En Ee Wre 4 49 1**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**First semester / Fourth Year**
8. Date Description	**1/9/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours weekly / Two units**
11. Course administrator's name (mention all, if more than one name)	**Prof. Dr. Nissren Jasim Hussien Al-Mansori**
	Email: Eng.nassrin.jassim@uobabylon.edu.iq

12. Course objectives

1. **To provide a foundational understanding of water resources and their significance** in civil and environmental engineering, including types and components of reservoirs.
2. **To develop the ability to analyze and design water storage systems**, such as reservoirs and dams, considering factors like storage capacity, site selection, losses, and sediment removal.
3. **To introduce various types of dams**, covering their advantages, disadvantages, economic considerations, and the structural design of concrete gravity and earthen embankment dams.
4. **To understand and apply principles of groundwater flow and seepage**, including seepage equations, groundwater hydraulics, and applications in water resource management.
5. **To equip students with the skills needed for irrigation and open channel flow design**, focusing on the selection, layout, and lining of irrigation systems and canals.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding of Reservoir and Dam Systems: Comprehend the types, components, and functions of reservoirs and dams, including factors influencing capacity, site selection, and associated losses.

A2. Fundamentals of Groundwater and Seepage Analysis: Understand the principles of groundwater hydraulics, seepage mechanisms, and the application of governing equations in evaluating subsurface water movement.

A3. Principles of Irrigation and Open Channel Flow: knowledge of irrigation methods, system design considerations, and the behavior of open channel flow, including design and lining techniques for efficient water delivery.

B- Subject-Specific Skills

B1. Design and Analysis of Water Retention Structures: Ability to design dams and reservoirs, considering storage capacity, site selection, and structural stability, including seepage control and sediment removal.

B2. Application of Groundwater Hydraulics: Skill in applying groundwater theory to analyze aquifer behavior, estimate well yields, and solve groundwater flow problems using hydraulic principles.

B3. Design of Irrigation and Open Channel Systems: Proficiency in planning and designing irrigation systems and open channel flows involves selecting appropriate irrigation methods and developing efficient, lined water channels conveyance.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	Learn about the importance of water resources.	Introduction to water resources and their importance.	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	Access to the details of aqueous reservoirs and their basic components.	Types of reservoirs, factors affecting them, and Total reservoir storage components.	=	=
3	**3 hours theoretical**	Learn how to calculate the capacity of a reservoir.	Different approaches to determine the capacity, selection of the site of reservoirs.	=	=
4	**3 hours theoretical**	Learn what storage waste is in general and ways to remove reservoir deposits.	Reservoir losses, Removal of deposited sediment.	=	=
5	**3 hours theoretical**	Learn about the types of dams, their advantages and disadvantages, and how to calculate the economic height of the dam.	Types of dams, the advantages and disadvantages, and the economic height of dams.	=	=
6	**3 hours theoretical**	Learn how to design concrete and filled dams.	Design of concrete gravity Dam sections, Design of Earthen Embankment.	=	=
7	**3 hours**	**Assess students' understanding of the topics covered in Water Resources Engineering.**	**Mid-term Exam (First Semester).**	-	**Written examination**
8	**3 hours theoretical**	Learn how to calculate leakage through porous media.	Seepage analysis and equations.		
9	**3 hours theoretical**	Learn about groundwater hydraulics and its theories.	Groundwater theory, hydraulics, and application.	=	=
10	**3 hours theoretical**	Learn about groundwater hydraulics and its theories.	Groundwater theory, hydraulics, and application	=	=
11	**3 hours theoretical**	Learn about different irrigation methods and choose the appropriate design.	Approach of irrigation, selection, and design.	=	=
12	**3 hours theoretical**	Learn about different irrigation methods and choose the appropriate design.	Approach of irrigation, selection, and design.	=	=
13	**3 hours theoretical**	Learn about the flow theories in open channels and methods of lining them.	Open channel flow, design, and lining.	=	=
14	**3 hours theoretical**	Learn about the flow theories in open channels and methods of lining them.	Open channel flow, design, and lining.	=	=
15	**3 hours**	**Assess students' understanding of the topics covered in Water Resources Engineering.**	**Final Exam (First Semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	**10% (10)**
Assignments	**10% (10)**
Midterm Exam	**20% (10)**
Final Exam	**60% (50)**
Total assessment	**100% (100 Marks)**

19. Learning and teaching resources

Required textbooks, curricular books, if any.	-
Main references (sources).	1. Water Resources. 2007. PHI, New Delhi Engineering, RALPH WURBS /JAMES. 2. Hydraulic Structures, Third Edition by P. Novak, A.I.B. Moffat, and C. Nalluri
Recommended books and references (scientific journals, reports...).	**Irrigation Engineering Sahasrabudhe, 2006, S.K. Kataria, Delhi, P10.**
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Air Pollution Control / En Ee Apc 4 50 2**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**75**
7. Semester / Year:	**First semester / Fourth Year**
8. Date Description	**1/9/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Five hours Weekly/ Three Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Prof. Rasha Salah Mahdi**
	Email: eng.rasha.salah@uobabylon.edu.iq

12. Course objectives

1. **To introduce the fundamental concepts of air pollution**, including its classification, sources, and the chemical and physical processes affecting atmospheric pollutants.
2. **To analyze the environmental and health impacts** of air pollutants at both local and global scales, highlight the role of meteorological phenomena and pollutant dispersion.
3. **To familiarize students with air quality monitoring techniques,** including instrumental methods used to measure and assess air pollution levels**.**
4. **To study various air pollution control technologies**, particularly for particulate contaminants (e.g., settling chambers, fabric filters, wet collectors, and electrostatic precipitators).
5. **To explore control methods for gaseous pollutants**, such as adsorption, absorption, and the application of local exhaust systems like hoods.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understand the classification, sources, and effects of air pollution: Comprehend its impact on health, ecosystems, and the atmosphere.

A2. Comprehend the principles of atmospheric chemistry and pollutant removal processes: Understand the principles of diffusion, meteorological factors, and transport of pollutants on local and global scales.

A3. Gain knowledge of air pollution control technologies: knowledge of the design and application of devices for particulate (e.g., fabric filters, electrostatic precipitators) and gaseous (e.g., adsorption, absorption) contaminants.

B- Subject-Specific Skills

B1. Air Quality Assessment and Analysis: Ability to apply principles and use instrumental methods to analyze and interpret air quality data on local and regional scales.

B2. Design and Operation of Pollution Control Devices: Skills in selecting, designing, and evaluating devices for controlling both particulate (e.g., fabric filters, electrostatic precipitators) and gaseous (e.g., adsorption, absorption) contaminants.

B3. Understanding and Application of Atmospheric Processes: Competence in analyzing meteorological phenomena, diffusion of pollutants, and their impacts on pollution transport and dispersion.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	3 hours theoretical + 2 hours practice	Tracking substances in the air that may harm people, animals, plants, or property, or interfere with our daily lives or activities.	Introduction to air pollution, Air quality issues, Atmospheric chemistry, and removal processes.	Theoretical lecture	Student participation, discussion + homework + oral exam
2	3 hours theoretical + 2 hours practice	Air pollution can be classified into various types based on its origin, height, location, and chemical makeup.	Classification of air pollution.	=	=
3	3 hours theoretical + 2 hours practice	Mobile Sources.	Sources of air pollution, Effects of air pollution.	=	=
4	3 hours theoretical + 2 hours practice	To analyze and monitor environmental pollutants as the two key pillars of ecological science. Some argue that a separate field called Eco analytics is already established. However, it's crucial to recognize that neither analysis nor monitoring alone can fully tackle issues related to pollution or environmental degradation.	Principles and applications of instrumental methods for analysis and determination of local and regional air quality.	=	=
5	3 hours theoretical + 2 hours practice	=	Meteorological phenomena.	=	=
6	3 hours theoretical + 2 hours practice	The study of Earth's atmosphere and its variations, particularly in forecasting, emphasizes understanding weather patterns as crucial indicators for predicting pollutant dispersion, including emissions from stacks and ground level.	The impacts of pollution on local and global scales. Diffusion of pollutants.	=	=
7	3 hours theoretical + 2 hours practice	**Assess students' understanding of the topics covered in Air Pollution Control.**	**Mid-term Exam (First Semester).**	-	**Written examination**
8	3 hours theoretical + 2 hours practice	It is essentially an air passage designed to increase the cross-sectional area, reducing horizontal velocities and giving the vertical flow enough time to carry particles to the floor.	Control device for particulate contaminants: Gravitational Settling Chamber.	=	=
9	3 hours theoretical + 2 hours practice	Centrifugal collectors rely on centrifugal force instead of gravity to separate particles from the gas stream.	Centrifugal Collectors, Wet Collector.	=	=
10	3 hours theoretical + 2 hours practice	In a fabric filter system, the particulate–laden gas stream passes through woven or felted fabric that filters out the particulate matter and allows the gas to pass through.	Fabric Filters.	=	=
11	3 hours theoretical + 2 hours practice	It involves understanding how electric fields remove charged particles from gases, recognizing the main components and principles of electrostatic precipitators, and being able to evaluate their efficiency and troubleshoot common problems.	Electrostatic Precipitation.	=	=
12	3 hours theoretical + 2 hours practice	To design the capture and removal of toxic emissions from various processes before they enter the workplace, the hood acts as the initial point for processing emissions into the exhaust system. Its primary function is to trap contaminants and direct them into the exhaust. To assist with this, an air collection system is installed nearby.	Air pollution control by Hoods.	=	=
13	3 hours theoretical + 2 hours practice	Adsorption is a process where a gas solute gathers on the surface of a solid or liquid, forming a molecular or atomic film (adsorbate).	Control device for gaseous contaminants: Adsorption.	=	=
14	3 hours theoretical + 2 hours practice	Absorption is a process where a gaseous pollutant dissolves in a liquid.	Absorption.	=	=
15	3 hours theoretical + 2 hours practice	**Assess students' understanding of the topics covered in Air Pollution Control.**	**Final Exam (First Semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	10% (10)
Laboratory	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	50% (50)

Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	-
Main references (sources).	**1.** Air Pollution by Henry C. Perkins 2008 **2.** Air Pollution Control Equipment Calculation by Louis Theodore, 2008 **3.** Air Pollution Control Engineering by Lawrence K. Wang, PhD, PE, DEE Zore Corporation, Newtonville, NY, Lenox Institute of Water Technology, Lenox, MA, Norman C. Pereira, PhD **4.** Monsanto Company (Retired), St. Louis, MO Yung-Tse Hung, PhD, PE, DEE Department of Civil and Environmental Engineering, Cleveland State University, Cleveland, OH, 2004 **5.** Fundamentals in Air Pollution from Processes to Modelling. Bruno Sportisse, 2009 **6.** Air Pollution Measurement, Modelling and Mitigation. Abhishek Tiwary and Jeremy Colls, 2010. 3rd edition. **7.** Environmental Engineering by General Kiely, 2006 **8.** Air Pollution. Sterin. 2004.
Recommended books and references (scientific journals, reports...).	
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Wastewater Engineering I / En Ee Wwe 4 51 3**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**75**
7. Semester / Year:	**First semester / Fourth Year**
8. Date Description	**1/9/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Five hours Weekly/ Three Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Asst. Prof. Dr. Ali Jalil Chabuk**
	Email: ali.chabuk@uobabylon.edu.iq

12. Course objectives

1. **To understand the fundamental characteristics of wastewater**, including its physical, chemical, and bacteriological parameters, for effective treatment system design.
2. **To analyze and select appropriate wastewater flow rates and constituent loadings**, enabling accurate planning of treatment plant capacity and efficiency.
3. **To introduce various physical unit processes** such as screening, grit removal, and flow equalization used in preliminary wastewater treatment.
4. **To provide knowledge of flotation processes**, including the design and operation of Dissolved Air Flotation (DAF) systems and the use of chemical additives.
5. **To equip students with the ability to design and evaluate screening devices, grit chambers, and flow measurement systems**, such as Parshall flumes, used in wastewater treatment facilities.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding the characteristics of wastewater, including physical, chemical, and bacteriological parameters, is essential for selecting appropriate treatment methods.

A2. Knowledge of preliminary and primary treatment processes, such as screening, grit removal, and flotation systems, including their design principles and operational mechanisms.

A3. Familiarity with flow measurement and equalization techniques, including the use of Parshall flumes and flow equalization basins to regulate and manage varying wastewater flow rates.

B- Subject-Specific Skills

B1. Ability to analyze and interpret wastewater characteristics, including physical, chemical, and bacteriological parameters, for effective treatment process selection.

B2. Skill in designing primary treatment units, such as screening devices, grit chambers, and flotation tanks, with appropriate calculations based on flow rates and loading.

B3. Competence in selecting and applying flow measurement and equalization techniques, including the use of devices like Parshall flumes and flow equalization basins in treatment systems.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical + 2 hours practice**	Gain an overview of wastewater engineering, including the characteristics of wastewater and its physical, chemical, and bacteriological parameters.	An overview	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical + 2 hours practice**	=	Characteristics of wastewater	=	=
3	**3 hours theoretical + 2 hours practice**	=	Physical and chemical Parameters.	=	=
4	**3 hours theoretical + 2 hours practice**	=	Bacteriological Parameters. Sludge treatment methods.	=	=
5	**3 hours theoretical + 2 hours practice**	Understanding of the analysis and selection of wastewater flow rates and constituent loading,	Analysis and selection of wastewater flow rates and constituent loading	=	=
6	**3 hours theoretical + 2 hours practice**	Understanding of Physicals unites processes	Physicals unite processes.	=	=
7	**3 hours theoretical + 2 hours practice**	Understanding of flow Measurement and Design (Parshall Flume).	Flow Measurement (Parshall Flume).	=	=
8	**3 hours theoretical + 2 hours practice**	Understanding flotation chemical additives to improve flotation processes, including dispersed air flotation (DAF), the mechanism of dissolved air flotation (DAF), and flotation tank design.	Flotation: Chemical Additives to Enhance Flotation Processes. Dispersed Air Flotation (DAF). The Mechanism of Dissolved Air Flotation (DAF). Design of Flotation Tanks.	=	=
9	**3 hours theoretical + 2 hours practice**	**Assess students' understanding of the topics covered in Wastewater Engineering.**	**Mid-term Exam (First Semester).**	-	**Written examination**
10	**3 hours theoretical + 2 hours practice**	understanding the types and designs of screening devices.	Types of Screening Devices.	=	=
11	**3 hours theoretical + 2 hours practice**	=	Design of Screening Devices.	=	=
12	**3 hours theoretical + 2 hours practice**	Understanding comminutors and flow equalization design.	Comminutors. Design of Flow Equalization.	=	=
13	**3 hours theoretical + 2 hours practice**	understand the types of grit chambers and their design.	Types of Grit Chamber.	=	=
14	**3 hours theoretical + 2 hours practice**	=	Design of Grit Chamber.	=	=
15	**3 hours theoretical + 2 hours practice**	**Assess students' understanding of the topics covered in Wastewater Engineering.**	**Final Exam (First Semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Laboratory	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	50% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	McGhee, J. (2007). Water supply and sewage. McGraw-Hill LTD.
Main references (sources).	▪ Baradei, M. M. (2018). Wastewater Treatment Plant Design Guide. Zayed International Foundation for the Environment. ▪ Special requirements (including, for example, workshops, periodicals, software, and websites).
Recommended books and references (scientific journals, reports...).	
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Industrial Pollution Control / En Ee Ipc 4 52 4**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**60**
7. Semester / Year:	**First semester / Fourth Year**
8. Date Description	**1/9/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Four hours Weekly / Three Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Asst. Prof. Dr. Wissam Al-Taliby**
	Email: Wissam.alwan@uobabylon.edu.iq

12. Course objectives

1. **To introduce students to the fundamental theories and practices of industrial pollution control,** focusing on the origin and characteristics of industrial waste.
2. **To understand and apply techniques for contaminant concentration reduction**, including neutralization, equalization, and proportioning processes.
3. **To examine various methods for removing suspended, colloidal, and dissolved solids** from industrial wastewater, including both inorganic and organic pollutants.
4. **To explore treatment and disposal methods for sludge and solid waste generated by industrial activities**, ensuring environmentally safe handling.
5. **To promote strategies for achieving zero pollution in industrial sectors**, emphasizing sustainable waste management and pollution prevention techniques.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding the origin, characteristics, and classification of industrial waste, including liquid, gaseous, and solid pollutants, generated by different industrial sectors.

A2. Comprehending various pollution control techniques such as neutralization, equalization, and removal of suspended, colloidal, and dissolved solids to reduce contaminant concentrations.

A3. Grasping the principles of sludge treatment and disposal, along with strategies and procedures aimed at achieving zero pollution in industrial processes.

B- Subject-Specific Skills

B1. Ability to design and apply appropriate treatment methods (e.g., neutralization, equalization, and solids removal) for reducing contaminant concentrations in industrial waste streams.

B2. Skill in identifying and characterizing different types of industrial waste (liquid, gaseous, and solid) based on their origin and composition for effective pollution control strategies.

B3. Competence in selecting and implementing sludge treatment and disposal techniques suitable for specific industrial processes to meet environmental regulations and sustainability goals.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**4 hours theoretical**	Learn about the Theories and practices of industrial pollution	Introduction – Theories and practices	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**4 hours theoretical**	Access to the details of the Contaminant concentration reduction	Contaminant concentration reduction	=	=
3	**4 hours theoretical**	Learn about the method of Neutralization	Neutralization	=	=
4	**4 hours theoretical**	Learn how to calculate Equalization and proportioning.	Equalization and proportioning	=	=
5	**4 hours theoretical**	Learn about the Removal of suspended solids and colloidal solids.	Removal of (suspended solids, colloidal solids)	=	=
6	**4 hours theoretical**	Learn how to remove (inorganic dissolved solids, organic dissolved solids)	Removal of (inorganic dissolved solids, organic dissolved solids)	=	=
7	**4 hours theoretical**	**Assess students' understanding of the topics covered in Industrial Pollution Control.**	**Mid-term Exam (First Semester).**	-	**Written examination**
8	**4 hours theoretical**	Learn how to treat and dispose of sludge solids	Treatment and disposal of sludge solids	=	=
9	**4 hours theoretical**	Learn about Procedures for the industry to attain zero pollution	Procedure for the sector in achieving zero pollution	=	=
10	**4 hours theoretical**	Learn about industries that dispose of liquid, gaseous, and solid wastes.	Industries produce liquid, gaseous, and solid wastes.	=	=
11	**4 hours theoretical**	Learn about industries that dispose of liquid, gaseous, and solid wastes.	Industries produce liquid, gaseous, and solid wastes.	=	=
12	**4 hours theoretical**	Learn about a detailed explanation of waste origin and characteristics	Detailed explanation of waste origin and characteristics	=	=
13	**4 hours theoretical**	Learn about a detailed explanation of waste origin and characteristics	Detailed explanation of waste origin and characteristics	=	=
14	**4 hours theoretical**	Learn about the Treatment suggested for all industrial facilities	Treatment is indicated for all industrial facilities	=	=
15	**4 hours theoretical**	**Assess students' understanding of the topics covered in Industrial Pollution Control.**	**Final Exam (First Semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	**10% (10)**
Assignments	**10% (10)**
Midterm Exam	**20% (10)**
Final Exam	**60% (50)**
Total assessment	**100% (100 Marks)**

19. Learning and teaching resources

Required textbooks, curricular books, if any.	
Main references (sources).	**Industrial Waste. 2007. PHI, New Delhi Engineering, RALPH WURBS /JAMES.**
Recommended books and references (scientific journals, reports...).	**Removal of industrial waste, 2006, S.K. Kataria, Delhi, P10.**
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Design of Water Distribution Network Systems/ En Ee Dwdns 4 53 5**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**First semester / Fourth Year**
8. Date Description	**1/9/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours Weekly / Two Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Prof. Dr. Khalid Safaa Hashim**
	Email:

12. Course objectives

1. **To introduce the fundamental components and layout configurations of water supply and distribution systems**, including gravity, pumping, and combined systems.
2. **To develop an understanding of water demand estimation**, covering domestic, industrial, public, and fire demands, along with factors affecting per capita consumption and variations in demand.
3. **To provide knowledge of population forecasting methods** for future water demand planning, using techniques such as arithmetic, geometric, and logistic growth models.
4. **To explain the hydraulic principles of pipe flow**, including head losses due to resistance, transitions, valves, fittings, and siphon action under pressure conditions.
5. **To equip students with skills for analyzing and designing water distribution networks**, including branched and looped systems, and using equivalent pipe methods for network optimization.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding of Water Supply System Components and Layouts: Includes knowledge of sources of supply, collection systems, distribution methods (gravity, pumping, combined systems), and layout types such as gridiron, radial, ring, and dead-end systems.

A2. Knowledge of Water Demand Estimation and Population Forecasting: Covers understanding of different water demands (domestic, industrial, commercial, public, fire), per capita demand, variation in demand, and forecasting techniques like arithmetic, geometric, and logistic growth methods.

A3. Comprehension of Hydraulic Principles and Pipe Network Analysis: Involves principles of pipe flow (form and surface resistance, losses), siphon action, pressure flow, and analysis of branched and looped pipe networks using methods like equivalent pipe analysis.

B- Subject-Specific Skills

B1. Ability to analyze and design water distribution network layouts (e.g., gridiron, radial, ring, and dead-end systems) considering pressure requirements, demand variations, and system configurations.

B2. Proficiency in applying hydraulic principles (pipe flow, friction losses, siphon action, and form losses) to size pipes, design flow paths, and select appropriate fittings and appurtenances (e.g., valves, meters, hydrants).

B3. Skill in performing population forecasting and demand estimation using methods like arithmetic and geometric increase, to determine future water requirements for reliable network design accurately.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	A water supply system includes its elements (components), the source of supply, the collection system, the water distribution, and the requirements of a distribution system.	Theoretical lecture	Student participation, discussion + homework + oral exam
2	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Layouts of distribution systems, including types such as gravity systems, pumping systems, combined pumping and gravity systems, and overall water distribution systems.	=	=
3	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Requirements of a sound distribution system, layouts of the distribution system, dead-end or tree system, gridiron system, circular or ring system, radial system.	=	=
4	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Distribution reservoirs, distribution system components, system configurations, water demands, various types of water demand, and domestic water demand.	=	=
5	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Industrial, institutional, and commercial demand; demand for public use; fire demand; losses and waste; per capita demand; factors affecting per capita demand.	=	=
6	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Variations in demand, seasonal fluctuations, daily changes, hourly shifts, design period, and total water requirements for a city.	=	=
7	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Required data include population density, zoning, design periods, and water consumption, along with methods for population forecasting such as the arithmetic increase method and the geometric increase method.	=	=
8	3 hours	**Assess students' understanding of the topics covered in Design of Water Distribution Network Systems.**	**Final Exam (First Semester).**	-	**Written examination**
9	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Uniform percentage method, curvilinear method, logistic method, declining growth method, ratio method, and basic principles of pipe flow.	=	=
10	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Surface resistance, form resistance, pipe bends, elbows, valves, sluice valve, rotary valve	=	=
11	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Transitions, gradual contraction, gradual expansion, optimal expansion transition, abrupt expansion, abrupt contraction.	=	=
12	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Pipe junction, pipe entrance, pipe outlet, overall form loss, pipe flow under siphon action, and flow in pipes under pressure.	=	=
13	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Pipes and requirements, laying and testing, maintenance of pipes, appurtenances in the distribution system, understanding the various appurtenances in a distribution system, and types of valves.	=	=
14	3 hours theoretical	Planning and designing drinking water networks and understanding the types of pipes used in them.	Sluice valves, check valves or reflux valves, air valves, drain valves or blow-off valves, scour valves, water meters.		
15	3 hours	**Assess students' understanding of the topics covered in Design of Water Distribution Network Systems.**	**Final Exam (First Semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	**10% (10)**
Assignments	**10% (10)**
Midterm Exam	**20% (10)**
Final Exam	**60% (50)**
Total assessment	**100% (100 Marks)**

19. Learning and teaching resources

Required textbooks, curricular books, if any.	
Main references (sources).	**1.** AWWA (1971). Water quality and treatment. 3rd ed., McGraw-Hill Book, New York. **2.** Prabhat K. Swamee, Ashok K. Sharma. 2008. Design of water supply pipe networks. John Wiley & Sons, Inc., Hoboken, New Jersey. **3.** Fair, G.M., Geyer, J.C., and Okun, D.A. 1981. Elements of Water Supply and Wastewater Disposal. John Wiley & Sons, New York. **4.** Garg, S.K. (1990). Water Supply Engineering, 6th ed., Khanna Publishers, Delhi, India. **5.** Degremont, T. (1991). Water treatment handbook. 6th ed., distributed by Halsted Press, New York. **6.** Layla, M.A., Ahmad, S., and Middlebrooks, E. J. (1980). Handbook of wastewater collection and treatment: Principles and practice. Garland Publishing, Inc., New York.

	7. Steel, E. W. and McGhee, T. J. (1979). Water supply and sewage. 5th ed., McGraw-Hill, Inc., New York. **8.** Viessman, Warren Jr., and Hammer, M. J. (1985). Water supply and pollution control. 4th ed., Harper and Row, Inc., New York. **9.** Metcalf and Eddy, Inc. (2003). Wastewater Engineering Treatment and Reuse. 3rd ed, McGraw-Hill, New York.
Recommended books and references (scientific journals, reports...).	
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Environment and Architecture I / En Ee Ea 4 54 6**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**First semester / Fourth Year**
8. Date Description	**1/9/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours Weekly / Two Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Lec. Ahmed Talib Sahib**
	Email: ahmed.auda@uobabylon.edu.iq

12. Course objectives

1. **To introduce the scientific principles of the built environment**, focusing on environmental physics and its impact on architectural design, comfort, and health.
2. **To develop an understanding of heat transfer mechanisms**—conductive, convective, and radiant—and their role in maintaining thermal comfort in buildings.
3. **To enable students to perform U-value calculations** and analyze building envelope performance in relation to energy efficiency and heat loss.
4. **To explore the interaction between buildings and environmental factors** such as air quality, ventilation, moisture control, and condensation prevention.
5. **To examine the influence of the electromagnetic spectrum**—including light and sound—on architectural design for creating comfortable and sustainable indoor environments.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Environmental Physics and Heat Transfer: Understanding the principles of conductive, convective, and radiant heat transfer, and their roles in achieving thermal comfort and energy efficiency in buildings.

A2. Comfort and Control in the Built Environment: Gaining knowledge of how environmental factors such as temperature, air quality, light, and sound influence occupant comfort, health, and building performance.

A3. U-Value Calculations and Energy Balances: Learning to calculate U-values and analyze surface radiation balances to evaluate the thermal performance of building materials and overall energy dynamics.

B- Subject-Specific Skills

B1. Applying U-value Calculations: Ability to assess thermal performance of building elements by calculating U-values for walls, roofs, and windows to improve energy efficiency.

B2. Analyzing Environmental Comfort Factors: Skill in evaluating and balancing thermal, acoustic, and air quality conditions within buildings to ensure occupant comfort and health.

B3. Interpreting and Applying Heat Transfer Principles: Competence in applying knowledge of conductive, convective, radiant, and evaporative heat transfer to optimize building design for energy performance and comfort.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	Built environment: basic scientific principles and issues of air quality, noise, and site planning	Introduction - Built environment: basic scientific principles	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	Discusses human comfort and efficient building design. Calculate the heat flow rate per unit area from the fluid (air).	Comfort and control U-value calculations	=	=
3	**3 hours theoretical**	Human comfort and efficient building.	Environmental physics: Comfort, health, and environmental physics	=	=
4	**3 hours theoretical**	Human comfort and efficient building.	Thermal and heat transfer (conductive, convective, radiant)	=	=
5	**3 hours theoretical**	The net radiative heating or cooling rate at the Earth's surface depends on radiation and wavelength.	Radiant heat transfer Surface Radiation Balance, The Earth's Spectrum	=	=
6	**3 hours theoretical**	Basic scientific principles	Evaporative heat transfer	=	=
7	**3 hours**	**Assess students' understanding of the topics covered in Environment and Architecture.**	**Final Exam (First Semester).**	-	**Written examination**
8	**3 hours theoretical**	Basic scientific principles, Human comfort, Environmental criteria	Comfort levels	=	=
9	**3 hours theoretical**	Basic scientific principles	Electromagnetic Spectrum Surface Radiation Balance, The Earth's Spectrum	=	=
10	**3 hours theoretical**	Basic scientific principles, Environmental criteria, daylighting calculations, and environmental criteria	Light, Sound	=	=
11	**3 hours theoretical**	Basic scientific principles, Human comfort, Environmental criteria	Air quality, **Ventilation**	=	=
12	**3 hours theoretical**	Basic scientific principles, maximum efficiency	Moisture, Condensation	=	=
13	**3 hours theoretical**	How to reduce energy in buildings	Buildings and energy balances	=	=
14	**3 hours theoretical**	The net radiative heating or cooling rate at Earth's surface, radiation, and wavelength.	Radiant Heat Transfer *(blackbody)*	=	=
15	**3 hours**	**Assess students' understanding of the topics covered in Environment and Architecture.**	**Final Exam (First Semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	**10% (10)**
Assignments	**10% (10)**
Midterm Exam	**20% (10)**
Final Exam	**60% (50)**
Total assessment	**100% (100 Marks)**

19. Learning and teaching resources

Required textbooks, curricular books, if any.	
Main references (sources).	1. Randall, T. 2007. Environmental Design: an introduction for architects and engineers. 2nd edition, E&FN Spon, Great Britain. 2. Masters, Gilbert M. 2005. Introduction to Environmental Engineering and Science. Prentice–Hall of India, New Delhi 3. Henry, J. Glynn, and Gary, W. Heinke. 2009. Environmental Science and Engineering. 2nd Edition, Prentice–Hall of India, New Delhi. 4. Sincero, Arcadio P., and Gregoria A. Sincero. 2010. Environmental Engineering: A design approach. Prentice–Hall of India, New Delhi. 5. James R. Mihelcic and Julie Beth Zimmerman. 2010. Environmental Engineering: Fundamentals, Sustainability, Design. John Wiley & Sons, Inc., USA. 6. Mackenzie, L. Davis, and Susan J. Masten. 2009. Principles of Environmental Engineering and Science. McGraw-Hill, New York, USA. **7.** David Lee Smith. 2011. Environmental Issues for Architecture, John Wiley & Sons, Inc., New Jersey, USA.
Recommended books and references (scientific journals, reports...).	
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Graduation Project / En Ee Gp 4 55 7**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**30**
7. Semester / Year:	**First semester / Fourth Year**
8. Date Description	**1/9/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Four hours weekly / Two Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: ****** **Email: *@uobabylon.edu.iq**

12. Course objectives

1. **Develop the Ability to Plan and Organize an Engineering Project:** Enable students to effectively design a detailed project plan, including defining objectives, scope, methodology, and timelines.
2. **Enhance Skills in Project Implementation and Monitoring:** Equip students to follow up on project progress, manage resources, troubleshoot challenges, and ensure successful execution.
3. **Improve Technical Communication and Presentation Abilities:** Train students to prepare and deliver professional seminars and reports that clearly communicate their project findings and engineering solutions.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Comprehensive Understanding of Project Scope and Objectives: Grasp the overall purpose, significance, and engineering relevance of the project, including its environmental impact and practical applications.

A2. Familiarity with Project Planning and Execution Processes: Understand the stages of project planning, scheduling, resource management, and continuous follow-up to ensure timely and effective completion.

A3. Insight into Technical Communication and Reporting: Knowledge of preparing and delivering seminars, documenting findings, and presenting technical information clearly and professionally throughout the project lifecycle.

B- Subject-Specific Skills

B1. Project Planning and Management: Ability to develop a detailed plan and timeline for the project, including setting objectives, milestones, and resource allocation.

B2. Technical Research and Problem-Solving: Skill in conducting comprehensive research, analyzing environmental engineering problems, and applying engineering principles to develop effective solutions.

B3. Project Documentation and Presentation: Competence in preparing technical reports, producing seminars, and effectively communicating project progress and outcomes to peers and supervisors.

C- Thinking skills

C1. Ability to analyze complex engineering problems.
C2. Ability to develop innovative and practical solutions.
C3. Ability to critically evaluate project outcomes and data.
C4. Ability to integrate multidisciplinary knowledge effectively.

14. Teaching and learning methods

1. **Lectures and project briefings**
2. **Individual and group supervision**
3. **Progress evaluations and feedback**
4. **Seminar and presentation sessions.**

15. Assessment Methods

1. **Project Proposal Evaluation**
2. **Progress Reports and Seminars**
3. **Final Project Report Submission**
4. **Oral Presentation and Defense**

16. Additional Teaching and Learning Methods

1. **Project orientation sessions**
2. **Workshops on project planning**
3. **Supervised progress meetings**
4. **Seminar presentation practice**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Project management skills**
2. **Critical thinking and problem-solving**
3. **Teamwork and collaboration**
4. **Technical report writing**
5. **Oral presentation skills**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	2 hours	Identify the importance of the proposed project	Introduction to the project	Discussion method in presenting project details	examinations and continuous follow-up by the teacher
2	2 hours	Access to the details of the engineering project	Important engineering project	=	=
3	2 hours	Develop a scientific plan for the project that includes all its details	Plan of the project	=	=
4	2 hours	Continuous follow-up by the instructor	Project follow-up	=	=
5	2 hours	=	=	=	=
6	2 hours	=	=	=	=
7	2 hours	=	=	=	=
8	2 hours	=	=	=	=
9	2 hours	The first presentation of the project	Produce the first seminar.	=	=
10	2 hours	Continuous follow-up by the instructor	Project follow-up: Part two of the project.	=	=
11	2 hours	=	=	=	=
12	2 hours	=	=	=	=
13	2 hours	=	=	=	=
14	2 hours	=	=	=	=
15	2 hours	=	=	=	=

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Exams for the first semester of the project:	10% (10)
Final exam:	20% (10)
Supervisor's evaluation for the first and final semester is:	20% (10)
Total assessment	50% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	**There are no specific methodological books.**
Main references (sources).	**The instructor decided on the project topic.**
Recommended books and references (scientific journals, reports...).	**The instructor decided on the project topic.**
Electronic references, Websites.	**The instructor decided on the project topic.**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**English VII / En Ee EL 4 56 8**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**30**
7. Semester / Year:	**First semester / Fourth Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Two hours per week / One unit**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Asst. Lec. Noor Ahmed**
	Email:

12. Course objectives

1. **Master the tense system and informal language:** To effectively understand and apply different tense forms and use informal language in everyday communication.
2. **Enhance vocabulary through compound words and missing words exercises:** To accurately identify and use compound words and fill in missing words to improve sentence construction skills.
3. **Apply present perfect and narrative tenses in context:** To confidently use present perfect (simple and continuous) and narrative tenses, including past perfect forms, for clear storytelling and description.
4. **Differentiate and use 'make' and 'do' correctly:** To develop the ability to distinguish between and appropriately use the verbs 'make' and 'do' in various expressions and sentences.
5. **Use future forms and expressions of quantity effectively:** To construct sentences using future tenses (will, going to, future continuous, future perfect) and correctly express quantities with countable and uncountable nouns.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understand and Apply the Tense System: To develop a solid understanding of English tenses, including present perfect, past perfect, and future forms, enabling accurate expression of time and sequence.

A2. Recognize and Use Vocabulary Structures: To understand the formation and usage of compound words, missing words, and common verb phrases such as "make and do" in everyday and academic contexts.

A3. Comprehend Grammatical Structures for Communication: To gain knowledge of sentence formation through questions, negatives, and expressions of quantity, supporting effective written and spoken communication.

B- Subject-Specific Skills

B1. Apply Verb Tense Structures Accurately: Ability to effectively use a range of verb tenses, including present perfect, narrative tenses, and future forms, in both spoken and written communication.

B2. Utilize Vocabulary and Word Formation Strategies: Capability to demonstrate the ability to understand and apply compound words, missing words, and variable stress patterns to enhance language precision.

B3. Construct Grammatically Correct Sentences: Skill to form accurate questions, negatives, and expressions of quantity, enabling clear and appropriate expression in various real-life and academic scenarios.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Research methodology

1. **Problem identification and objective setting**
2. **Literature review and data collection**
3. **Method selection and project planning**
4. **Data analysis and result interpretation**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**2 hours theoretical**	Identifying and comparing past, present, and future tenses in active and passive forms.	The tense system + informal language	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**2 hours theoretical**	Colloquial language and how we commonly omit some words in informal spoken and written English.	Missing words + compound words	=	=
3	**2 hours theoretical**	Present Perfect (both continuous and straightforward) and past tense forms.	Present perfect: simple and continuous	=	=
4	**2 hours theoretical**	Phrases, collocations, and phrasal verbs with make and do.	Make and do	=	=
5	**2 hours theoretical**	Past Simple, Continuous, and Past Perfect Simple and Continuous in active and passive voices.	Narrative tenses: simple and continuous, past perfect: simple and continuous	=	=
6	**2 hours theoretical**	Talking about books, films, and theatre.	Talking about movies and books	=	=
7	**2 hours**	**Assess students' understanding of the topics covered in English.**	**Final Exam (First Semester).**	-	**Written examination**
8	**2 hours theoretical**	Learning about the function and form of negative and short questions.	Questions and negatives	=	=
9	**2 hours theoretical**	Making positive statements into negative ones in a variety of ways.	Saying the opposite	=	=
10	**2 hours theoretical**	Reviewing, identifying, and labelling future forms and talking about what difference choosing from these forms makes.	Future forms – will and going to	=	=
11	**2 hours theoretical**	How to talk about the future using the present continuous and the present simple tenses	Present continuous and straightforward.	=	=
12	**2 hours theoretical**	It aims to help students accurately understand and use these tenses to describe actions that will be ongoing at a specific future time (Future Continuous) and actions that will be completed before a specific future moment (Future Perfect), in both spoken and written forms.	Future continuous & future perfect	=	=
13	**2 hours theoretical**	Using phrasal verbs formed from take and put Two-syllable words can be stressed in different ways, whether they are nouns, adjectives, or verbs.	Common verbs – take and put Words with variable stress	=	=
14	**2 hours theoretical**	Matching quantity expressions of uncountable & countable nouns to talk about amounts accurately. Discussing the differences between common countable & uncountable nouns.	Expressions of quantity: countable and uncountable	=	=
15	**2 hours theoretical**	**Assess students' understanding of the topics covered in English.**	**Final Exam (First Semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	**10% (10)**
Assignments	**10% (10)**
Midterm Exam	**20% (10)**
Final Exam	**60% (50)**
Total assessment	**100% (100 Marks)**

19. Learning and teaching resources

Required textbooks, curricular books, if any.	Liz Soars, John Soars, Paul Hancock, Headway upper intermediate, 5th Ed.; Oxford University Press, 2019.
Main references (sources).	Lecture notes
Recommended books and references (scientific journals, reports...).	
Electronic references, websites.	▪ **Websites**

Fourth stage - Second semester

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Hydraulic Structures Engineering / En Ee Hse 4 57 9**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**Second semester / Fourth Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours per week / Two units**
11. Course administrator's name (mention all, if more than one name)	**Prof. Dr. Nisren Jasim Hussien Al-Mansori**
	Email: Eng.nassrin.jassim@uobabylon.edu.iq

12. Course objectives

1. **Understand the Fundamentals of Hydraulic Structures:** To introduce students to the essential principles and components involved in hydraulic engineering structures and their role in water resources management.
2. **Analyze Seepage and Subsurface Flow Behavior:** To develop the ability to apply seepage theories (Bligh's, Lane's, and Khosla's) in evaluating the stability and safety of hydraulic structures.
3. **Design Energy Dissipation Systems:** To provide knowledge on hydraulic jumps and the design of stilling basins as effective energy dissipation mechanisms downstream of hydraulic structures.
4. **Design Flow Conveyance Systems:** To equip students with the skills to design closed conduits such as pipes and culverts, and to plan proper transitions in hydraulic structures.
5. **Plan and Design Water Control Structures:** To enable students to design various flow regulation structures such as spillways, weirs (sharp-crested, broad-crested, contracted, and suppressed), regulators, and steel gates.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Knowledge of Seepage Theories: To analyze seepage under hydraulic structures using Bligh's, Lane's, and Khosla's theories to ensure stability and control of sub-surface flow.

A2. Understanding Hydraulic Energy Dissipation: To evaluate and apply the principles of hydraulic jumps and the design of stilling basins for energy dissipation in open channel flows.

A3. Knowledge of Structural Design Elements: To design critical hydraulic components such as spillways, weirs, and culverts by applying theoretical and practical engineering principles.

B- Subject-Specific Skills

B1. Apply Seepage Theories to Foundation Design: Ability to evaluate subsurface flow behavior using Bligh's, Lane's, and Khosla's theories for designing safe and effective hydraulic structures.

B2. Design Energy Dissipation Systems: Skill to design stilling basins and accurately assess hydraulic jumps for controlling high-velocity flows and protecting downstream channels.

B3. Plan and Design Hydraulic Structures: Capability to apply technical knowledge in the design of key components such as spillways, culverts, steel gates, and weirs based on site-specific hydraulic requirements.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	Learning about the importance of hydraulic structures	Introduction – Essentials of Hydraulic Structures Eng.	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	Access to the details of seepage and its fundamental analysis	Theory of seepage, approach analysis	=	=
3	**3 hours theoretical**	Learn how to calculate the seepage according to theory.	Blighes, Lains, and Khosla theories.	=	=
4	**3 hours theoretical**	Learn how to calculate the seepage according to theory.	Blighes, lanes, Khosla theory	=	=
5	**3 hours theoretical**	Learn about the types of hydraulic jump, their advantages and disadvantages, and how to calculate them.	Hydraulic jump	=	=
6	**3 hours theoretical**	Learn how to design Stilling basins	Design of Stilling basins	=	=
7	**3 hours**	**Assess students' understanding of the topics covered in Hydraulic Structures Engineering.**	**Final Exam (Second Semester).**	-	**Written examination**
8	**3 hours theoretical**	Learn how to design culverts, etc.	Design closed pipes and culverts.	=	=
9	**3 hours theoretical**	Learn about how transitions are designed.	Design of transitions	=	=
10	**3 hours theoretical**	Learn about the types of weirs and their discharge	Types of weirs: sharp, broad, contracted, suppressed	=	=
11	**3 hours theoretical**	Learn about the types of steel gate designs.	Design of steel gates	=	=
12	**3 hours theoretical**	Learn about the types of steel gate designs.	Design of steel gates	=	=
13	**3 hours theoretical**	Learn about the different types of spillway design.	Design of spillway	=	=
14	**3 hours theoretical**	Learn about the different types of spillway design. Learn about the theories of the design of regulators.	Design of spillway. Design of the regulator	=	=
15	**3 hours**	**Assess students' understanding of the topics covered in Hydraulic Structures Engineering.**	**Final Exam (Second Semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	**10% (10)**
Assignments	**10% (10)**
Midterm Exam	**20% (10)**
Final Exam	**60% (50)**
Total assessment	**100% (100 Marks)**

19. Learning and teaching resources

Required textbooks, curricular books, if any.	
Main references (sources).	**1. Hydraulic Structures Engineering. 2007. PHI, NEW DELHI ENGINEERING, RALPH WURBS /JAMES.** **2. Hydraulic Structures, 3rd Edition. P. Novak, A.I.B. Moffat, and C. Nalluri**
Recommended books and references (scientific journals, reports...).	**Irrigation Engineering SahasrabudhE. 2006. S.K. Kataria. Delhi, P10.**
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Noise Pollution Control / En Ee Npc 4 58 10**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**75**
7. Semester / Year:	**Second semester / Fourth Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Five hours Weekly / Three Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Asst. Prof. Dr. Wissam Al-Taliby**
	Email: Wissam.alwan@uobabylon.edu.iq

12. Course objectives

1. **Understand the Fundamentals of Sound and Its Properties:** To familiarize students with the nature, types, and production of sound, including infrasonic, sonic, and ultrasonic waves, along with their characteristics such as speed, frequency, and wavelength.
2. **Analyze Sound Measurement Parameters:** To equip students with the knowledge of key acoustic parameters, including sound pressure, intensity, energy density, sound pressure level (SPL), and the use of decibel scales for sound measurement.
3. **Interpret Frequency and Sound Spectrum:** To develop the ability to analyze octave bands, audio frequencies, and the frequency spectrum, including those relevant to human hearing and speech.
4. **Assess the Health and Environmental Impacts of Noise:** To understand the physiological and psychological effects of noise on humans, including hearing loss, loudness perception, and the need for setting environmental noise criteria.
5. **Apply Tools and Techniques for Noise Monitoring:** To train students in the use of sound level meters and other instrumentation for measuring and evaluating environmental and occupational noise levels.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Knowledge of Sound Fundamentals: Understanding the nature and generation of sound, including infrasonic, sonic, and ultrasonic waves, and the relationship between speed, frequency, and wavelength to analyze acoustic phenomena effectively.

A2. Understanding of Acoustic Measurement Principles: To accurately interpret sound pressure, intensity, energy density, decibel levels, and SPL calculations, which are essential for evaluating environmental and industrial noise levels.

A3. Awareness of Health and Environmental Impacts: Understanding the impact of environmental noise on human health, including hearing loss, noise criteria, and exposure indices, to contribute to the development and application of noise control standards.

B- Subject-Specific Skills

B1. Measure and Analyze Sound Levels: Ability to operate sound level meters and calculate sound pressure levels (SPL), power levels, and overall decibel values for various acoustic environments.

B2. Classify and Interpret Acoustic Data: Skill to interpret frequency spectra, identify octave bands, and distinguish between infrasonic, sonic, and ultrasonic frequencies for practical noise assessments.

B3. Assess and Manage Environmental Noise Impacts: Capability to evaluate noise exposure indices, understand risk criteria, and apply measurement techniques to mitigate the effects of noise on human health and the environment.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical + 2 hours practice**	Learn about the effect of noise. Recognition of sound waves.	Effect of infrasonic. Sonic and ultrasonic sound.	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical + 2 hours practice**	Knowing the nature of sound. Measuring the speed of sound. Frequency and sound wave.	Nature and generation of sound. Speed of sound. Frequency and wavelength of a sound wave.	=	=
3	**3 hours theoretical + 2 hours practice**	Frequency analysis.	Octave, wave, octave band, and their determination.	=	=
4	**3 hours theoretical + 2 hours practice**	Set power intensity and density.	Pressure intensity energy density.	=	=
5	**3 hours theoretical + 2 hours practice**	Get to know the unit of measurement. Sound level measurement. Energy level.	Level and decibels, sound pressure level. Calculation and overall SPL values. Power and pressure level.	=	=
6	**3 hours theoretical + 2 hours practice**	Know the concept of sound frequency. Sound wave frequencies.	Audio frequency. Infra and ultrasonic frequencies.	=	=
7	**3 hours theoretical + 2 hours practice**	Frequency spectrum. Recognize the frequency spectrum of the human voice.	Frequency spectrum. Frequency spectrum of human voice.	=	=
8	**3 hours + 2 hours**	**Assess students' understanding of the topics covered in Noise Pollution Control.**	**Final Exam (Second Semester).**	-	**Written examination**
9	**3 hours theoretical + 2 hours practice**	Knowing the sound meter. Pressure level. Hearing loss.	Sound level meter. Intensity and pressure level. Hearing loss.	=	=
10	**3 hours theoretical + 2 hours practice**	Noise limiters. Recognize the effects of noise.	Noise criteria. Risk criteria.	=	=
11	**3 hours theoretical + 2 hours practice**	Exposure indicators. The noise. Frequency response.	Noise exposure indices. Loudness. Frequency response.	=	=
12	**3 hours theoretical + 2 hours practice**	Knowing the permissible limits of noise and how to calculate them.	The threshold of hearing and pain for audible speech.	=	=
13	**3 hours theoretical + 2 hours practice**	Determining the effects of noise on humans.	Environmental noise and its impact on humans.	=	=
14	**3 hours theoretical + 2 hours practice**	Understand why determinants are needed. How to measure the noise in the environment.	Need for criteria. Measurement of environmental noise.	=	=
15	**3 hours + 2 hours**	**Assess students' understanding of the topics covered in Noise Pollution Control.**	**Final Exam (Second Semester).**	-	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Laboratory	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	50% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	▪ **Lecture** ▪ **Noise pollution by Lara Saenz**
Main references (sources).	
Recommended books and references (scientific journals, reports...).	
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Wastewater Engineering II / En Ee Wwe 4 59 11**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**75**
7. Semester / Year:	**Second semester / Fourth Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Five hours Weekly / Three Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Asst. Prof. Dr. Ali Jalil Chabuk**
	Email: ali.chabuk@uobabylon.edu.iq

12. Course objectives

1. **Understand Gravity Separation and Sedimentation:** To develop an understanding of gravity separation theory, settling velocity challenges, and the design principles of primary sedimentation tanks.
2. **Apply Principles of Chemical and Biological Treatment:** To explore the fundamentals of chemical unit processes and biological treatment, focusing on activated sludge systems and their operational controls.
3. **Design Key Wastewater Treatment Units:** To enable students to design critical treatment units such as aeration tanks, trickling filters, lagoons, and stabilization ponds.
4. **Analyze and Design Secondary Treatment Components:** To study the function and design of secondary clarifiers and gain insight into sludge treatment processes.
5. **Explore Disinfection and Advanced Treatment Methods:** To provide an overview of effluent disinfection techniques and introduce advanced wastewater treatment technologies.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Knowledge of Gravity Separation and Settling Theory: Understanding gravity separation principles and analyzing settling velocity problems is critical for primary sedimentation design.

A2. Understanding of Biological Treatment Fundamentals: Understanding of chemical and biological unit processes, including the activated sludge process, is essential for effective wastewater treatment.

A3. Familiarity with Aeration and Clarification Systems: Knowledge of designing aeration tanks and secondary clarifiers with a clear understanding of their functions and performance criteria in wastewater treatment systems.

B- Subject-Specific Skills

B1. Design and Analyze Sedimentation Units: Ability to apply gravity separation theory and calculate settling velocities for the effective design and evaluation of primary sedimentation tanks.

B2. Develop and Operate Biological Treatment Processes: Skill to understand and manage the activated sludge process and associated control parameters for efficient biological treatment of wastewater.

B3. Design and Assess Aeration Systems: Ability to design aeration tanks and evaluate their performance based on treatment objectives and operational needs.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical + 2 hours practice**	Understanding of gravity separation theory: problems of determining the settling velocity.	Gravity separation theory.	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical + 2 hours practice**	=	Problems of determining the settling velocity.	=	=
3	**3 hours theoretical + 2 hours practice**	Understand primary sedimentation, design terms of primary sedimentation tanks, and the design of primary sedimentation tanks.	Primary sedimentation.	=	=
4	**3 hours theoretical + 2 hours practice**	=	Design Terms of Primary Sedimentation Tanks	=	=
5	**3 hours theoretical + 2 hours practice**	=	Design of Primary sedimentation tanks.	=	=
6	**3 hours + 2 hours**	**Assess students' understanding of the topics covered in Wastewater Engineering.**	**Final Exam (Second Semester).**	**-**	**Written examination**
7	**3 hours theoretical + 2 hours practice**	Understanding of chemical unit processes, fundamentals of biological treatment,	Chemical unit processes; Fundamentals of biological treatment	=	=
8	**3 hours theoretical + 2 hours practice**	Understanding of the activated sludge process, design of aeration tanks, and design of aeration and mixing systems.	Description of the activated sludge process.	=	=
9	**3 hours theoretical + 2 hours practice**	=	Activated Sludge Control items.	=	=
10	**3 hours theoretical + 2 hours practice**	=	Design of aeration tanks.	=	=
11	**3 hours theoretical + 2 hours practice**	=	Design of aeration tanks.	=	=
12	**3 hours theoretical + 2 hours practice**	Understanding of lagoons and stabilization ponds, trickling filters.	Lagoons and stabilization ponds, trickling filters. Modified activated sludge, Sludge treatment (overview).	=	=
13	**3 hours theoretical + 2 hours practice**	Understanding of secondary clarifiers (principle and design).	Secondary clarifiers (principle and design).	=	=
14	**3 hours theoretical + 2 hours practice**	Understanding of effluent disinfection and an overview of advanced wastewater treatment.	Effluent disinfection. Advanced wastewater treatment (overview).	=	=
15	**3 hours + 2 hours**	**Assess students' understanding of the topics covered in Wastewater Engineering.**	**Final Exam (Second Semester).**	**-**	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Laboratory	10% (10)
Assignments	10% (10)
Midterm Exam	20% (10)
Final Exam	50% (50)
Total assessment	100% (100 Marks)

19. Learning and teaching resources

Required textbooks, curricular books, if any.	▪ McGhee, J. (2007). Water supply and sewage. McGraw-Hill LTD.
Main references (sources).	▪ Baradei, M. M. (2018). "Wastewater Treatment Plant Design Guide", Zayed International Foundation for the Environment.
Recommended books and references (scientific journals, reports...).	Special requirements (including, for example, workshops, periodicals, and software).
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Environmental Management / En Ee En 4 60 12**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**Second semester / Fourth Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours weekly / Two units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Asst. Lec. Mustafa Abdulkarem Obayes**
	Email: mustafa.alyousif96@uobabylon.edu.iq

12. Course objectives

1. **Understand Global Environmental Issues:** To identify, assess, and propose solutions to significant global environmental challenges such as climate change, deforestation, and pollution.
2. **Apply Principles of Geographic Information Systems (GIS):** To develop the ability to use GIS tools in analyzing environmental data and supporting sustainable planning and decision-making.
3. **Implement Environmental Management Systems (EMS):** To gain knowledge on the structure and application of EMS, including ISO 14000 standards, for improving environmental performance in organizations.
4. **Conduct Environmental Impact Assessments (EIA):** To understand and apply the process of EIA in evaluating potential impacts of development projects on the environment.
5. **Manage Solid Waste and Wastewater:** To analyze and design management strategies for the efficient treatment and disposal of solid waste and wastewater in urban and industrial contexts.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Knowledge of Global Environmental Issues: Understanding the causes, impacts, and interconnections of major global environmental problems to propose mitigation and adaptation strategies effectively.

A2. Understanding Environmental Management Systems (EMS): Knowledge to evaluate and implement structured environmental management frameworks, including ISO 14000 standards, within various organizational settings.

A3. Knowledge of Environmental Impact Assessment (EIA): Skill to comprehend and apply the fundamental principles, stages, and methodologies of EIA in analyzing the potential environmental effects of proposed projects.

B- Subject-Specific Skills

B1. Ability to Apply Environmental Impact Assessment (EIA) Techniques: To successfully evaluate potential environmental effects of development projects by implementing standard EIA methodologies.

B2. Ability to Implement Environmental Management Systems (EMS): To develop and apply structured environmental policies and procedures in accordance with ISO 14000 standards for sustainable operational practices.

B3. Ability to Utilize Geographic Information Systems (GIS): To effectively analyze spatial environmental data for informed decision-making and resource management.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	Learn about the concept of environmental management and its importance	Introduction to environmental management	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	Identify the most critical global environmental issues	Global environmental issues	=	=
3	**3 hours theoretical**	Learn about geographic information systems	Principles of geographic information systems	=	=
4	**3 hours theoretical**	Identify the characteristics and capabilities of geographic information systems.	Principles of geographic information systems	=	=
5	**3 hours theoretical**	Learn about the principles of remote sensing	Principles of remote sensing and image processing	=	=
6	**3 hours theoretical**	Learn about the principles and types of clean technology	Cleaner production and clean technology	=	=
7	**3 hours theoretical**	Identify the concept and types of environmental management systems	Environmental management system	=	=
8	**3 hours**	**Assess students' understanding of the topics covered in Environmental Management.**	**Final Exam (Second Semester).**	**-**	**Written examination**
9	**3 hours theoretical**	Learn about the steps for conducting an environmental impact assessment	Environmental impact assessment	=	=
10	**3 hours theoretical**	Learn about pollution control methods	Regulatory and non-regulatory methods of pollution control	=	=
11	**3 hours theoretical**	Learn about the ISO14000 system family and its importance	Structure of the ISO 14000 international standard family	=	=
12	**3 hours theoretical**	Understand how to apply the standard	Structure of the ISO 14000 international standard family	=	=
13	**3 hours theoretical**	Learn about water and air quality management methods	Water and air quality management	=	=
14	**3 hours theoretical**	Learn about waste and wastewater management methods	Solid waste and wastewater management	=	=
15	**3 hours**	**Assess students' understanding of the topics covered in Environmental Management.**	**Final Exam (Second Semester).**	**-**	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	**10% (10)**
Assignments	**10% (10)**
Midterm Exam	**20% (10)**
Final Exam	**60% (50)**
Total assessment	**100% (100 Marks)**

19. Learning and teaching resources

Required textbooks, curricular books, if any.	
Main references (sources).	Lectures prepared by the teacher Introduction to Environmental Management. Mary K. Theodore Louis Theodore.
Recommended books and references (scientific journals, reports...).	Cleaner Production Technologies and Tools for Resource Efficient Production Book 2 in a series on Environmental Management Lennart Nilsson, Per Olof Persson, Lars Rydén, Siarhei Darozhka and Audrone Zaliauskiene.
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Design of Wastewater Collection Network Systems/ En Ee Dwwcns 4 61 13**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**Second semester / Fourth Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours weekly / Two units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Prof. Dr. Alaa Hussien Wadi**
	Email:

12. Course objectives

1. **Understand Sources and Characteristics of Sewage:** To identify various sources of wastewater and analyze the factors affecting its quantity and quality.
2. **Evaluate Infiltration, Inflow, and Flow Fluctuations:** To assess the impacts of infiltration and inflow on sewer design and account for peak flow variations in system planning.
3. **Differentiate Between Sewer Collection Systems:** To distinguish between separate and combined sewer systems and determine their appropriate applications in urban planning.
4. **Design Sanitary Sewer Networks:** To apply engineering principles in the hydraulic and structural design of efficient and sustainable sanitary sewer systems.
5. **Incorporate Sewer Appurtenances in Design:** To integrate essential sewer components such as manholes, drop structures, and cleanouts to ensure operational reliability and maintenance access.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Sewage Sources and Flow Fluctuations: Knowledge to identify sources of sewage and understand how infiltration, inflow, and peak variations influence system design.

A2. Sewer Collection System Types: Understanding how to differentiate between separate and combined sewer systems and evaluate their advantages based on site-specific conditions.

A3. Sanitary Sewer System Design: Knowledge to apply key design principles in developing sanitary sewer networks, considering hydraulic requirements and sewer appurtenances.

B- Subject-Specific Skills

B1. Analyze Sewage Flow and Infiltration Patterns: Ability to assess sources of sewage, account for infiltration and inflow, and evaluate peak flow conditions for accurate system sizing.

B2. Select and Apply Collection System Types: Ability to distinguish between separate and combined sewer systems and implement the appropriate type based on environmental and engineering criteria.

B3. Design Sanitary Sewer Networks and Appurtenances: Skill to design sanitary sewer systems, including hydraulic calculations and integration of essential appurtenances for efficient wastewater conveyance.

C- Thinking skills

C1. Ability to distinguish and connect related information.
C2. Engage in reciprocal discussions.
C3. Approaches to handling field applications.
C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	Providing educational skills to identify types of liquid waste	Sources of sewage	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	Providing educational skills to identify types of liquid waste.	Infiltration, inflow, and peaks.	=	=
3	**3 hours theoretical**	Providing educational skills to identify types of liquid waste.	Infiltration, inflow, and peaks.	=	=
4	**3 hours theoretical**	Providing educational skills to identify types of liquid waste.	Fluctuation in sewage flow.	=	=
5	**3 hours theoretical**	Providing educational skills to identify types of liquid waste.	Fluctuation in sewage flow.	=	=
6	**3 hours theoretical**	Gaining educational skills - choosing the appropriate system for designing the drainage network.	Types of collection system: a separate system.	=	=
7	**3 hours theoretical**	Gaining educational skills - choosing the appropriate system for designing the drainage network.	Types of collection system: a separate system.	=	=
8	**3 hours theoretical**	Gaining educational skills - choosing the appropriate system for designing the drainage network.	Combined sewer system.	=	=
9	**3 hours theoretical**	**Assess students' understanding of the topics covered in Design of Wastewater Collection Network Systems.**	**Final Exam (Second Semester).**	**-**	**Written examination**
10	**3 hours**	Calculating flow rates for liquid waste.	Amount of storm sewage system. Underground drainage and sewage.	=	=
11	**3 hours theoretical**	Planning and designing sewage networks and knowing the types of pipes used in sewage networks.	Design of a sanitary sewer system.	=	=
12	**3 hours theoretical**	Planning and designing sewage networks and knowing the types of pipes used in sewage networks.	Design of a sanitary sewer system.	=	=
13	**3 hours theoretical**	Planning and designing sewage networks and knowing the types of pipes used in sewage networks.	Sewer appurtenances.	=	=
14	**3 hours theoretical**	Planning and designing sewage networks and knowing the types of pipes used in sewage networks.	Sewer appurtenances.	=	=
15	**3 hours**	**Assess students' understanding of the topics covered in Design of Wastewater Collection Network Systems.**	**Final Exam (Second Semester).**	**-**	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	**10% (10)**
Assignments	**10% (10)**
Midterm Exam	**20% (10)**
Final Exam	**60% (50)**
Total assessment	**100% (100 Marks)**

19. Learning and teaching resources

Required textbooks, curricular books, if any.	
Main references (sources).	1. AWWA. (1971). Water quality and treatment. 3rd ed., McGraw-Hill Book, New York. 2. Prabhata K. Swamee, Ashok K. Sharma. 2008. Design of water supply pipe networks. John Wiley & Sons, Inc., Hoboken, New Jersey. 3. Fair, G.M., Geyer, J.C., and Okun, D.A. (1981). Elements of Water Supply and Wastewater Disposal. John Wiley & Sons, New York. 4. Garg, S.K. (1990). Water Supply Engineering. 6th ed., Khanna Publishers, Delhi, India. 5. Degremont, T. (1991). Water treatment handbook. 6th ed., distributed by Halsted Press, New York. 6. Layla, M.A., Ahmad, S., and Middlebrooks, E. J. (1980). Handbook of wastewater collection and treatment: Principles and practice, Garland Publishing, Inc., New York. 7. Steel, E. W. and McGhee, T. J. (1979). Water supply and sewage. 5th ed., McGraw-Hill, Inc., New York. 8. Viessman, Warren Jr., and Hammer, M. J. (1985). Water supply and pollution control. 4th ed., Harper and Row, Inc., New York. 9. Metcalf and Eddy, Inc. (2003). Wastewater Engineering Treatment and Reuse. 3rd ed, McGraw-Hill, New York.
Recommended books and references (scientific journals, reports...).	Water supply and sewage. 1991. 6th edition. Terence J. McGhie.
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Environment and Architecture II / En Ee Ea 4 62 14**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**45**
7. Semester / Year:	**Second semester / Fourth Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Three hours weekly / Two units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Prof. Dr. Khalid Safaa Hashim**
	Email:

12. Course objectives

1. **Understanding Building Planning and Design Principles:** To develop a foundational understanding of how the building's form and orientation affect environmental performance, comfort, and functionality.
2. **Analyze the Role of Building Envelopes:** To explore the control of solar radiation, ventilation, heat loss, and noise through thoughtful design of building skins and envelopes.
3. **Apply Site Planning Strategies for Environmental Optimization:** To evaluate site selection, microclimate conditions, and landscaping techniques that enhance sunlight access, solar gain, and outdoor comfort.
4. **Interpret and Apply Electromagnetic Spectrum Knowledge:** To understand the relevance of the electromagnetic spectrum in architectural design, particularly in the context of light, heat, and material interaction.
5. **Evaluate Environmental Impact of Building Materials:** To assess materials based on their environmental performance, health impacts, and suitability for sustainable construction practices.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Knowledge of Building Planning and Design: To assess how building forms, orientation, and envelope design influence solar radiation control, ventilation, heat loss, and acoustic comfort.

A2. Understanding of Site Planning and Microclimate: To evaluate the effects of site selection, microclimate conditions, and landscaping on environmental factors like daylight, solar gain, and ventilation.

A3. Knowledge of Environmental Aspects of Materials and Construction: To identify and select construction materials based on environmental performance, health impact, and suitability for sustainable design.

B- Subject-Specific Skills

B1. Analyze Building Envelopes and Environmental Performance: Ability to evaluate how building form and "skin" interact with solar radiation, ventilation, and heat loss to optimize environmental comfort and energy efficiency.

B2. Apply Site Planning Principles: Ability to assess site-specific factors such as microclimate, sunlight exposure, and landscaping to enhance daylight access, solar gain, and passive design strategies.

B3. Select Environmentally Responsible Materials: Skill to choose construction materials based on environmental health impacts, performance characteristics, and their suitability for sustainable architectural applications.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**3 hours theoretical**	To provide a basis for articulating the building on site.	Building planning and design: From the building's body.	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**3 hours theoretical**	Comfortable internal.	Building's skin: Solar radiation.	=	=
3	**3 hours theoretical**	Human comfort and efficient building.	Ventilation, Heat loss, Noise.	=	=
4	**3 hours theoretical**	Human comfort and efficient building.	Control of building envelopes, Two (more) models.	=	=
5	**3 hours theoretical**	The importance of regions to climate.	Site planning: Site selection.	=	=
6	**3 hours theoretical**	Basic scientific principles	Microclimate and landscaping.	=	=
7	**3 hours theoretical**	Basic scientific principles, human comfort, and Environmental criteria. Basic scientific principles.	Sunlight and solar gain, Daylight and views. Electromagnetic spectrum.	=	=
8	**3 hours**	**Assess students' understanding of the topics covered in Environment and Architecture.**	**Final Exam (Second Semester).**	**-**	**Written examination**
9	**3 hours theoretical**	Awareness of the environmental impact of materials and examination of basic criteria for their selection.	Materials and construction.	=	=
10	**3 hours theoretical**	Basic scientific principles Environmental criteria.	Selection of materials.	=	=
11	**3 hours theoretical**	Basic scientific principles, human comfort, and Environmental criteria	Environmental aspects of materials and health.	=	=
12	**3 hours theoretical**	Natural ventilation requirements.	Collecting the Opening areas for ventilation.	=	=
13	**3 hours theoretical**	Ambient air change and the value of Radon pollution.	Indoor Radon Concentration.	=	=
14	**3 hours theoretical**	Sun position. It means radiant temperature calculation.	Altitude and azimuth. RNT (Mean radiant temperature calculation).	=	=
15	**3 hours**	**Assess students' understanding of the topics covered in Environment and Architecture.**	**Final Exam (Second Semester).**	**-**	**Written examination**

18. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	**10% (10)**
Assignments	**10% (10)**
Midterm Exam	**20% (10)**
Final Exam	**60% (50)**
Total assessment	**100% (100 Marks)**

19. Learning and teaching resources

Required textbooks, curricular books, if any.	
Main references (sources).	1. Randall, T. 2007. Environmental Design: an introduction for architects and engineers. 2nd edition, E&FN Spon, Great Britain. 2. Masters, Gilbert M. 2005. Introduction to Environmental Engineering and Science. Prentice–Hall of India, New Delhi 3. Henry, J. Glynn, and Gary, W. Heinke. 2009. Environmental Science and Engineering. 2nd Edition, Prentice–Hall of India, New Delhi. 4. Sincero, Arcadio P., and Gregoria A. Sincero. 2010. Environmental Engineering: A design approach. Prentice–Hall of India, New Delhi. 5. James R. Mihelcic and Julie Beth Zimmerman. 2010. Environmental Engineering: Fundamentals, Sustainability, Design. John Wiley & Sons, Inc., USA. 6. Mackenzie, L. Davis, and Susan J. Masten. 2009. Principles of Environmental Engineering and Science. McGraw-Hill.
Recommended books and references (scientific journals, reports...).	
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**English VIII / En Ee EL 4 63 15**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**30**
7. Semester / Year:	**Second semester / Fourth Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Two hours per week / One unit**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: Lec. Dr. Waleed Ali Hasan**
	Email: Eng.waleed.ali@uobabylon.edu.iq

12. Course objectives

1. **Apply Modals and Related Verbs:** To accurately use modals, related verbs, and common verbs like "get" in structured communication by following grammatical conventions.
2. **Interpret Literary and Informational Texts:** To effectively analyze texts such as From India to Sweden with Love and The Excellent Vikings by identifying features like exaggeration, idioms, and tone.
3. **Produce Structured and Purposeful Writing:** To successfully write across genres—argumentative, descriptive, and narrative—by organizing ideas clearly and using relevant grammar and vocabulary**.**
4. **Use Advanced Grammar and Vocabulary:** To confidently implement relative clauses, participles, adverb collocations, and vocabulary such as homonyms, word pairs, and expressions with time and life**.**
5. **Enhance Pronunciation and Speaking Skills:** To improve intonation, stress, and emphasis in speech for clear and expressive verbal communication**.**

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. Understanding and applying grammatical structures: Knowledge of modals and related verbs, common verbs like "get", relative clauses, and adverb collocations to enhance accuracy in spoken and written English.

A2. Interpreting and analyzing a range of texts: Understanding how to identify tone, exaggeration, idioms, and figurative language in readings such as From India to Sweden with Love, A Fairy Tale of New York, and The Excellent Vikings.

A3. Producing effective and purposeful writing: Ability to write in various forms—argumentative, descriptive, and narrative—using appropriate vocabulary, grammatical structures, and stylistic features such as emphasis, expressions with life and time, and word pairs.

B- Subject-Specific Skills

B1. Use and manipulate complex grammatical structures: Ability to apply modals and related verbs, relative clauses, and participles to enhance clarity and precision in both writing and speaking.

B2. Analyze and respond to varied texts: Ability to interpret and engage with diverse readings like From India to Sweden with Love and A Fairy Tale of New York, recognizing rhetorical devices such as exaggeration, understatement, and idioms.

B3. Produce coherent and effective written communication: Skill to develop and structure writing for different purposes—arguing your case, describing places, and narrative writing—incorporating appropriate vocabulary, emphasis, and stylistic features.

C- Thinking skills

C1. Ability to distinguish and connect related information.

C2. Engage in reciprocal discussions.

C3. Approaches to handling field applications.

C4. Employ brainstorming techniques.

14. Teaching and learning methods

1. **Lecture-based teaching.**
2. **Group discussions.**
3. **Practical exercises**

15. Assessment Methods

1. **Mid-semester tests during the academic year.**
2. **Final examination.**
3. **Ongoing discussions and dialogues with students.**
4. **Assignments involving field applications**

16. Additional Teaching and Learning Methods

1. **Lecture delivery.**
2. **Group discussions.**
3. **Short unannounced quizzes.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Ability to clearly and confidently express ideas verbally through dialogues and group discussions.**
2. **Ability to clearly express oneself through writing.**
3. **Ability to write and edit investigative reports according to scientific standards.**
4. **Ability to employ journalistic investigations for community development.**
5. **Ability to cultivate a spirit of initiative in asking questions relevant to the lecture topic or related concepts.**

17. Course structure

Week	Hours	Required learning outcomes	Unit or subject name	Teaching method	Evaluation method
1	**2 hours theoretical**	The use of modal verbs and their meanings	Modals and related verbs; common verbs - get	Theoretical lecture	Student participation, discussion + homework + oral exam
2	**2 hours theoretical**	How to use English expressions to state exaggerations and understatement	exaggeration and understatement; from India to Sweden with love (reading); arguing your case (writing)	=	=
3	**2 hours theoretical**	Using relative pronouns. Defining and non-defining relative clauses. Punctuation and pronunciation in relative clauses. Proverbs include relative clauses.	Relative clauses – present and past participles; adverb collocations	=	=
4	**2 hours theoretical**	Improving the students' knowledge in using relative clauses	Exclamations: a fairy tale of New York(reading); describing places (writing).	=	=
5	**2 hours theoretical**	Present habit: Present Simple/will and is always + -Ing. Past habit: Past Simple / would/was always + -Ing and used to. Be/get used to doing.	Expressing habits; homonyms and homophones; moans and groans.	=	=
6	**2 hours theoretical**	Strengthening students' ability to express their habitat	Living in the past (reading); writing for talking.	=	=
7	**2 hours**	**Assess students' understanding of the topics covered in English.**	**Final Exam (Second Semester).**	**-**	**Written examination**
8	**2 hours theoretical**	Learning how to express degrees of probability using modal verbs	Modal verbs of probability in the past; metaphors and idioms – the body	=	=
9	**2 hours theoretical**	Improving writing skills	stress and intonation; the excellent Vikings (reading); adding emphasis (writing).	=	=
10	**2 hours theoretical**	• Using I wish ... and If only... about present, past, and hypothetical situations. • Other expressions for hypothesizing: It's time, I'd rather, Supposing. • First, second, and third conditionals.	Hypothesizing; word pairs; liking, and commenting	=	=
11	**2 hours theoretical**	Improving reading skills. Improving writing skills in telling stories	Have you ever wondered (reading). Narrative writing (writing)	=	=
12	**2 hours theoretical**	• a/an, the, one, and zero article. • Determiners which express quantity.	Articles and determiners; expressions with life and time	=	=
13	**1 hour theoretical**	Teaching students how to use English to express what they mean.	Making your point.	=	=
14	**2 hours theoretical**	Improving reading skills	biological time (reading).	=	=
15	**3 hours**	**Assess students' understanding of the topics covered in English.**	**Final Exam (Second Semester).**	**-**	**Written examination**

20. Course evaluation

Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.

Quizzes	**10% (10)**
Assignments	**10% (10)**
Midterm Exam	**20% (10)**
Final Exam	**60% (50)**
Total assessment	**100% (100 Marks)**

21. Learning and teaching resources

Required textbooks, curricular books, if any.	Liz Soars, John Soars, Paul Hancock, Headway Upper-Intermediate, 5th Ed.; Oxford University Press, 2019.
Main references (sources).	Lecture notes
Recommended books and references (scientific journals, reports...).	
Electronic references, websites.	▪ **Websites**

1. Educational institution	**University of Babylon**
2. Faculty/Department	**Department of Environmental Engineering**
3. Course Name/Code	**Graduation Project / En Ee Gp 4 55 8**
4. Programs Included	**Bachelor's Degree**
5. Available attendance Mode	**Weekly**
6. Total Study Hours	**30**
7. Semester / Year:	**First semester / Fourth Year**
8. Date Description	**19/1/2025**
9. Available Attendance Forms:	**In-class**
10. Number of Credit Hours (Total) / Number of Units (Total)	**Four hours weekly / Two Units**
11. Course administrator's name (mention all, if more than one name)	**Lecturer: ****** **Email: *@uobabylon.edu.iq**

12. Course objectives

1. **Complete and Implement Project Plans:** To successfully execute the second phase of the project by following the detailed project plan and applying engineering principles to solve environmental problems.
2. **Enhance Project Management and Follow-up Skills:** To develop the ability to continuously monitor, evaluate, and adjust the project progress through effective follow-up and coordination.
3. **Develop Communication and Presentation Skills:** To prepare and deliver professional seminars (second and final) that clearly communicate project results, challenges, and recommendations to peers and evaluators.

13. Intended Learning Outcomes, Teaching and Learning Methods, and Assessment Methods

A- Knowledge and understanding

A1. In-depth Understanding of Project Execution: Comprehend the detailed steps involved in completing engineering projects, including monitoring progress and implementing planned solutions.

A2. Significance of Project Management and Follow-up: Understand the importance of continuous project tracking and timely adjustments to ensure successful project completion.

A3. Effective Communication of Project Outcomes: Gain knowledge of preparing and delivering final seminars that clearly present project findings, conclusions, and practical implications.

B- Subject-Specific Skills

B1. Project Execution and Problem-Solving: Applying engineering knowledge and technical skills to advance the second phase of the project, addressing real-world environmental challenges effectively.

B2. Project Monitoring and Management: Developing skills to track progress, manage resources, and adapt project plans based on continuous evaluation and follow-up activities.

B3. Technical Communication and Presentation: Preparing and delivering detailed seminars (second and final) that demonstrate the ability to communicate complex technical information clearly and professionally.

C- Thinking skills

C1. Ability to analyze complex engineering problems.
C2. Ability to develop innovative and practical solutions.
C3. Ability to critically evaluate project outcomes and data.
C4. Ability to integrate multidisciplinary knowledge effectively.

14. Teaching and learning methods

1. **Lectures and project briefings**
2. **Individual and group supervision**
3. **Progress evaluations and feedback**
4. **Seminar and presentation sessions.**

15. Assessment Methods

1. **Project Proposal Evaluation.**
2. **Progress Reports and Seminars.**
3. **Final Project Report Submission.**
4. **Oral Presentation and Defense.**

16. Additional Teaching and Learning Methods

1. **Project orientation sessions.**
2. **Workshops on project planning.**
3. **Supervised progress meetings.**
4. **Seminar presentation practice.**

D- General and Transferable Skills (Other skills related to employability and personal development)

1. **Project management skills.**
2. **Critical thinking and problem-solving.**
3. **Teamwork and collaboration.**
4. **Technical report writing.**
5. **Oral presentation skills.**

17. Course structure					
Week	**Hours**	**Required learning outcomes**	**Unit or subject name**	**Teaching method**	**Evaluation method**
1	**2 hours**	Identify the importance of the 2nd part of the proposed project	The second part of the project	Discussion method in presenting project details	examinations and continuous follow-up by the teacher
2	**2 hours**	Access to the details of the engineering project	Importance of engineering projects	=	=
3	**2 hours**	Develop a scientific plan for the project that includes all its details	Plan of the project	=	=
4	**2 hours**	Continuous follow-up by the instructor	Project follow-up	=	=
5	**2 hours**	=	=	=	=
6	**2 hours**	=	=	=	=
7	**2 hours**	=	=		
8	**2 hours**	=	=	=	=
9	**2 hours**	The second presentation of the project	Produce the second seminar.	=	=
10	**2 hours**	Continuous follow-up by the instructor	Project follow-up: Part two of the project.	=	=
11	**2 hours**	=	=	=	=
12	**2 hours**	=	=	=	=
13	**2 hours**	=	=	=	=
14	**2 hours**	=	=	=	=
15	**2 hours**	The final presentation of the project	Produce the final seminar.	=	=

18. Course evaluation	
Distributing the score out of 100 according to the tasks assigned to the student, such as daily preparation, daily oral, monthly, or written exams, reports, etc.	
Exams for the second semester of the project:	10% (10)
Final exam:	20% (10)
Supervisor's evaluation for the second and final semester is:	20% (10)
Total assessment	50% (100 Marks)

19. Learning and teaching resources	
Required textbooks, curricular books, if any.	**There are no specific methodological books.**
Main references (sources).	**The instructor decided on the project topic.**
Recommended books and references (scientific journals, reports...).	**The instructor decided on the project topic.**
Electronic references, Websites.	**The instructor decided on the project topic.**