Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation Apparatus
Directorate of Quality Assurance and Academic Accreditation
Accreditation Department

Academic Program and Course Description Guide

2025

Introduction:

The Chemical Engineering Department at Babylon University creates an inspiring education and research environment for students, faculty, and staff to expand knowledge and improve life through research and engineering education innovation. It acts as a “living laboratory” that successfully prepares tomorrow's forward-thinking leaders with the experience needed to succeed

The chemical engineering curriculum at Babylon University provides a strong foundation in the fundamental principles of chemistry, physics, mathematics, and engineering. You will gain in-depth knowledge of thermodynamics, reaction kinetics, mass and heat transfer, fluid mechanics, process control, and chemical plant design.

This program emphasizes both theoretical and practical aspects of the field. The students will not only learn the essential concepts but also have the opportunity to apply them through laboratory experiments, computer simulations, and design projects.

In conclusion, this guide serves as a comprehensive resource for prospective Chemical Engineering students at Babylon University. We encourage further exploration of the curriculum, faculty profiles, and career opportunities to discover how a Chemical Engineering degree can empower you to make a global impact.

Concepts and terminology:

Academic program Description

The Chemical Engineering program at Babylon University equips students to design, develop, and optimize processes for transforming raw materials. The rigorous curriculum emphasizes both theory (chemistry, physics, mathematics, engineering) and practical application (labs, simulations, design projects) in areas like thermodynamics, reaction kinetics, mass & heat transfer, and process control. Graduates are prepared for careers in diverse industries like oil & gas, pharmaceuticals, and environmental engineering, with strong technical skills and a problem-solving approach.

Course discerption

The Chemical Engineering program at Babylon University equips students to design, develop, and optimize processes for transforming raw materials. The rigorous curriculum emphasizes both theory (chemistry, physics, mathematics, engineering) and practical application (labs, simulations, design projects) in areas like thermodynamics, reaction kinetics, mass & heat transfer, and process control. Graduates are prepared for careers in diverse industries like oil & gas, pharmaceuticals, and environmental engineering, with strong technical skills and a problem-solving approach.

Program vision

The Chemical department decided to carry out a process of self-assessment using the format adopted by the University of Babylon. This is the Draft report of the self-assessment. The material for this assessment was gathered according to the

Self-Assessment Criterion adopted by the Ministry of Higher Education. A Department Project Team (DPT) supervised and coordinated the preparation of this material.

Program Mission

The department can point out the following points:

Prepare students to graduate as engineers with strong chemical, scientific, and professional skills in chemical engineering that responds to the community's needs and focuses on analysis and decision-making.

1. Activate postgraduate studies.
2. Participate in scientific activities through updated research and taking part in symposiums and conferences.
3. Playing a leading role in improving public services with regard to the industry sector through scientific consultations to state institutions and private sector.
4. Encouraging graduate engineers to working in team in practical fields at researches and projects.

Program objective

1. Improve and maintain academic standards.
2. Enhance students learning.
3. Verify that the existing programs meet their objectives and institutional goals.
4. Provide feedback for quality assurance of department programs.
5. Prepare the department program for accreditation.

Curriculum objective

Even though the department does not have a formal written strategic plan for the achievement of its objectives, it carries a number of steps to address these objectives.

1. The CE department strives to recruit and retain excellent faculty members who have received very high academic training from well-recognized universities and institutions in the Middle East.
2. The faculty has strengths in heat and mass transfer, Process instrumentation and control, corrosion control, reaction engineering, environment protection, oil and gas, process safety and risk management and Nano-technology.
3. Young faculty members, in different specializations, are continuously recruited to complement the faculty.
4. The department fosters the faculty development through sabbatical leave of study, attendance of professional and scientific meetings.
5. Close cooperation in teaching and research with faculty in material engineering, petroleum engineering and other related departments is very common and is strongly encouraged.
6. In its endeavor to produce graduates who are able to practice Chemical engineering, the CE department adopts an up-to-date curriculum.
7. Up-to-date textbooks support the curriculum. Supplementary and additional material is also used if warranted.
8. Faculty members use Web-based software for course management. This is done through the support of college and university.
9. The department is currently undertaking a major revision of the undergraduate program. The revision has taken into consideration input from alumni, and employers.

10. The University library is centrally located within the campus. The current collection for Chemical Engineering is about 1500 books.

Learning outcomes

Table 1.1 shows the outcomes that are aligned with each objective. For example, to produce graduates who are able to practice chemical engineering a number of skills, or an outcome is required. Such graduates should have the ability to apply knowledge of mathematics and science **(a),** to design experiments **(b),** to solve chemical engineering problems **(c),** to understand professional responsibilities **(e),** to analyze and design complex plants **(j)** and to recognize the relationship between society and chemical engineering. These abilities are realized through the introduction of well-structured courses by highly qualified faculty.

Table 1.1 Outcomes versus objectives

Outcomes/Objectives	1	2	3	4	5
A	√	√		√	
B	√	√		√	√
C	√	√	√		
D		√	√	√	√
E	√	√		√	
F			√		√
G			√	√	√
H			√	√	
I		√			√
J	√		√	√	
K	√	√		√	

Teaching and learning strategies

Students and instructors should jointly develop the content and teaching strategies. Students should actively participate and decide in the process of learning. The classroom should provide experiences that students are going to encounter in the workplace. Empowering the students and engaging them in the learning process is the goal and path to life-long learning.

Academic Program Description Form

University Name: university of Babylon

Faculty/Institute: college of engineering

Scientific Department: chemical engineering

Academic or Professional Program Name: B.Sc. chemical engineering

Final Certificate Name: Bachelor of Science in Chemical Engineering

Academic System: full time

Description Preparation Date:

Completion Date:7-4-20245

Signature:

Head of Department Name:

Prof Dr. Shamam Fadhil Alwash

Date: 5/5/2025

Signature:

Scientific Associate Name: Date:

Prof Dr. Ali Hasson Nahab

The file is checked by:

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date:

Signature:

Dr. Zainab Ali Omran

Approval of the Dean

1. Program Vision

The department seeks to achieve scientific specificity by enriching the students studying in it with practical and applied capabilities and experiences that extend to the nature of the University of Babylon.

2. Program Mission

Each program must have a mission, quantifiable, measurable objectives and expected outcomes for graduates. The outcomes include competency and tasks graduates are expected to perform after completing the program. A strategic plan must be in place to achieve the program objectives. The extent to which these objectives are achieved through continuous assessment and improvements must be demonstrated.

3. Program Objectives

The Chemical Engineering program has been carefully prepared for students for the profession of chemical engineering through study, experience, and practice to:

a. To prepare engineers with basic scientific and chemical knowledge.

b. To allow graduates to design factories related to the chemical, petroleum, petrochemical, and food industries.

c. To prepare graduates to operate and manage the chemical factories by concentrating on the theoretical and practical side.

d. To enrich the learning process with the high studies curriculum and applied scientific research, stressing its role in serving society and solving its problems.

4. Program Accreditation

Accreditation Board for Engineering and Technology (ABET)

5. Other external influences

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution requirements	8	120-150		
College requirements	8	120-150		
Department Requirements	8	120-150		
Summer Training				
Other				

* This can include notes whether the course is basic or optional.

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
Year 1	**UOBAB0104011**	**Computer Science**	**theoretical**	**practical**
	UOBAB0104012	**Mathematics I**		
	UOBAB0104013	**Chemical Engineering Principles I**		
	UOBAB0104014	**Analytical Chemistry**		
	UOBAB0104015	**Engineering Drawing and AUTO CAD**		
	UOBAB0104016	**Arabic language**		
	UOBAB0104021	**Mathematics II**		
	UOBAB0104022	**Chemical Engineering Principles II**		
	UOBAB0104023	**Engineering Statistics**		
	UOBAB0104024	**Organic Chemistry**		
	UOBAB0104025	**Engineering**		

		Mechanics and strength of Materials		
	UOBAB0104026	**Human rights , freedom and democracy**		
Year 2		**Programing Engineering language1**		
		Engineering Statistics		
		Engineering Materials		
		Industrial Safety		
		Mathematics III		
		Mathematics IV		
		Fluid Flow I		
		Fluid Flow II		
		Properties of petroleum and natural gas		
Year 3		**Electrochemical Engineering**		
		Thermodynamics 1		
		Thermodynamics 2		
		Engineering analysis		
		Heat transfer I		
		Corrosion engineering		
		Mass Transfer-I		
		Mass Transfer-II		
		Reactor design		
		petroleum refinery engineering		
		Renewable Energy Resources		
Year 4		**Unit Operation**		
		Nanotechnology		
		Process Control I		
		Process Control II		
		Chemical Industries		
		petrochemical Industries		
		Pollution		

		Gas processing		
		equipment design1		
		equipment design11		
		Catalyst		

8. **Expected learning outcomes of the program**	
Knowledge	
A1.	Bachelor's graduates have general knowledge of the foundations and history of mathematics, natural sciences and technology, in particular those of their own discipline
A2.	Bachelor's graduates have mastered the basic concepts of their own discipline to a certain extent and are familiar with the interrelationships of these concepts within their own discipline as well as with other disciplines
A3.	. Bachelor's graduates have in-depth knowledge of several current topics within their own discipline.
A4.	Bachelor's graduates are familiar with the quantitative character of the fields of mathematics and natural sciences and have an understanding of the methods used in these fields, and particularly within their own discipline, including computer-aided methods.
Skills	
B1.	(Research) Bachelor's graduates are able to draw up research questions, design, plan and conduct research and report on it independently with a certain degree of supervision. Bachelor's graduates are able to evaluate the value and limitations of their research and assess its applicability outside their own field.
B2.	(Designing) bachelor's graduates are able to translate a problem, in particular a design problem, into a plan of approach and – taking into account the requirements of the client and/or technical preconditions – find a solution.
B3.	(Gathering information) bachelor's graduates are able to gather relevant information using modern means of communication and to critically interpret this information.

B4.	(Collaborating) bachelor's graduates are able to collaborate in teams (including multidisciplinary teams) on technical-scientific problems.
Ethics	
C1,	knowledge of the most important fields of i) process. technology: physical transport phenomena chemical reactor separation methods, and engineering process design, ii) product technology: materials science, design methodology, and processing, and iii) basic aspects of chemistry: inorganic, organic, analytical, physical, and polymer chemistry and biochemistry.
C2 ,	. skilled in the use of standard laboratory procedures and in the use of equipment for synthetic and analytical work, necessary background knowledge of Mathematics and Physics
C3	. understanding of the position and role of the discipline within science and society, and also in the international character of the discipline. The Bachelor's graduate has become familiar with the following key elements of Chemical Engineering:
C4.	Important aspects of chemical terminology, nomenclature and conventions

9. Teaching and Learning Strategies

Teaching and learning strategies and methods adopted in the implementation of the program in general.

10. Evaluation methods

Implemented at all stages of the program in general.

11-Faculty member

No.	Name	FT or PT	Specialization	Scientific Rank	Years of Experience
1	Dr. Tahseen Ali Al-Hattab	FT	Mass transfer	Prof.	31
2	Dr. Kadhim Finteel Al-Sultani	FT	Corrosion Engineering	Prof.	22
3	Dr Ali Safa Nouri Alsaegh	FT	Mechanical Eng Power	Lecturer	20
4	Dr. Shaker Salih Bahar	FT	Corrosion Engineering	Prof.	17
5	Dr. Nahlla Jabbar	FT	Computers	Lecturer	28
6	Alaa Noor Al-Mousawi	FT	Mass transfer	Assist. Prof	27
7	Satteh Kadhem Ijam	FT	Water treatment	Assist. Prof	35
8	Dr. Hameed Hussain	FT	Mass transfer	Prof	16
9	Dr. Hassanain Ali	FT	Heat transfer	Lecturer	12
10	Dr. Muataz Mohammed	PT	Electrochemical Eng	Assist. Prof	12
11	Zaid Nidhal	FT	Process safety and risk management	Lecturer	10
12	Noora Hamza	FT	Electronics	Assist. Lecturer	12
13	Dr. Ahmad Sayeb	FT	power	Prof	18
14	Dr. Haneen Zuhair	FT	Polymer and composite materials engineering	Assist. Prof	18
15	Dr. Sarmmad AbdAl-Rassoul	FT	Applied Mechanics	Lecturer	14
16	Dr. Hayfaa Adnan AbdAlameer	FT	Chemical science-Organic	Assist. Prof	18
17	Farah Aziz Juber	FT	Petroleum Refinery	Assist. Lecturer	4
18	Roaya Mahmood Jaleel	FT	Mechanical Power	Assist. lecturer	16
19	Marwah Husseini	FT	Catalyst	Assist. Lecturer	7
20	Dr. Ali Obaid Imarah	FT	Biochemical engineering	Lecturer	14
21	Ameer Abed Alrazaak latif	FT	Oil and gas tech.	Assist. Lecturer	0
22	Ameer Abed Alkareem Hadi	FT	Oil and gas Eng.	Assist. Lecturer	0
23	Ali Mohammed Suhail	FT	Oil and gas Eng.	Assist. Lecturer	0

Professional Development
Mentoring new faculty members
Briefly describes the process used to mentor new, visiting, full–time, and part–time faculty at the institution and department level.
Professional development of faculty members
Briefly describe the academic and professional development plan and arrangements for faculty such as teaching and learning strategies, assessment of learning outcomes, professional development, etc.

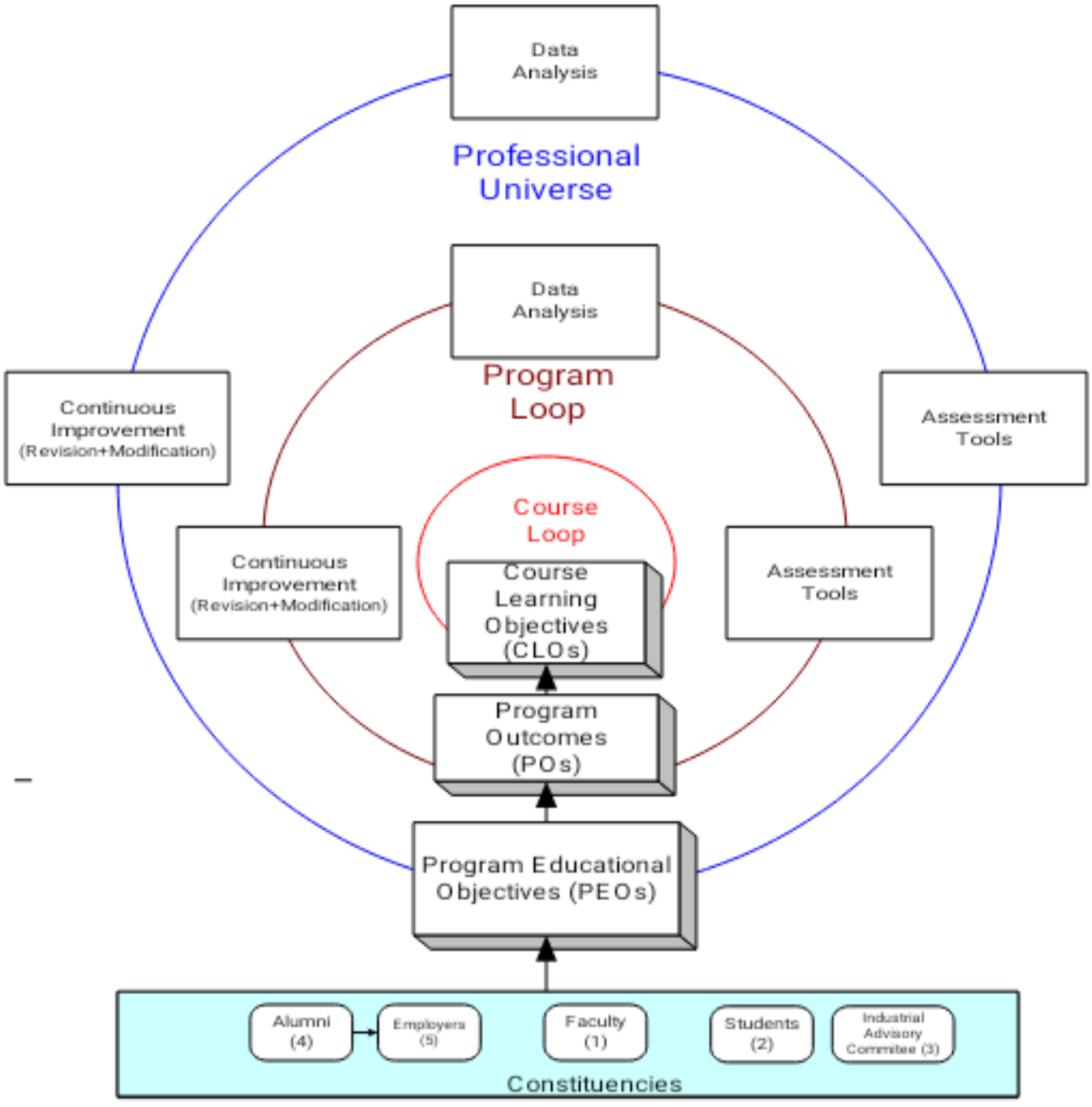
12. Acceptance Criterion
(**Setting regulations related to enrollment in the college or institute, whether central admission or others**)

13. The most important sources of information about the program
State briefly the sources of information about the program.

14. Program Development Plan

The Chemical Engineering Technology program of the CE Department has an ongoing assessment and continuous improvement plan. The plan has gone through an evolutionary path and was refined during this time frame. The department has embraced the general philosophy of Outcome Based Education. In its current form it is designed to encompass all aspects of Outcome Based Assessment conforming to TAC/ABET's model as shown in

Figure .1.


Data Analysis
Professional Universe
Data Analysis
Program Loop
Continuous Improvement (Revision+Modification)
Assessment Tools
Course Loop
Continuous Improvement (Revision+Modification)
Assessment Tools
Course Learning Objectives (CLOs)
Program Outcomes (POs)
Program Educational Objectives (PEOs)
Alumni (4)
Employers (5)
Faculty (1)
Students (2)
Industrial Advisory Committee (3)
Constituencies

Program Skills Outline

				Required program Learning outcomes											
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
1	UOBAB0104011	Computer Science	Basic			√				√			√		
	UOBAB0104012	Mathematics I	Basic				√				√			√	
	UOBAB0104013	Chemical Engineering Principles I	Basic				√				√				√
	UOBAB0104014	Analytical Chemistry	Basic			√				√				√	
	UOBAB0104015	Engineering Drawing and AUTO CAD	Basic			√				√			√		
	UOBAB0104016	Arabic language	Basic		√				√					√	
	UOBAB0104021	Mathematics II	Basic												
	UOBAB0104022	Chemical Engineering Principles II	Basic				√				√				√
	UOBAB0104023	Engineering Statistics	Basic			√				√			√		
	UOBAB0104024	Organic Chemistry	Basic				√				√			√	
	UOBAB0104025	Engineering Mechanics and strength of Materials	Basic				√				√				√
	UOBAB0104026	Human rights , freedom and democracy	Basic			√				√				√	

			Basic			√				√			√		
2	UoB12345	Programing Engineering language1	Basic		√				√					√	
	CHE220	Engineering Statistics	Basic												
	CHE210	Engineering Materials	Basic				√				√				√
	UOBAB0104044	Industrial Safety	Basic			√				√			√		
	ENCHMaIV2 1301	Mathematics III	Basic				√				√			√	
	ENCHMaIV2 1307	Mathematics IV	Basic				√				√				√
		Fluid Flow I	Basic			√				√				√	
		Fluid Flow II	Basic			√				√			√		
		Properties of petroleum and natural gas	Basic		√				√					√	
			Basic												
3		Electrochemical Engineering	Basic				√				√				√
	CHE-00	Thermodynamics 1	Basic			√				√			√		
		Thermodynamics 2	Basic				√				√			√	
		Engineering analysis	Basic				√				√				√

		Heat transfer I	Basic			√				√				√	
		Corrosion engineering	Basic			√				√			√		
		Mass Transfer-I	Basic		√				√					√	
		Mass Transfer-II	Basic												
	chE3211	Reactor design	Basic				√				√				√
		petroleum refinery engineering	Basic												
		Renewable Energy Resources	Basic			√				√			√		
4		Unit Operation	Basic				√				√			√	
	CHE424	Nanotechnology	Basic				√				√				√
		Process Control I	Basic			√				√				√	
		Process Control II	Basic			√				√			√		
		Chemical Industries	Basic		√				√					√	
		petrochemical Industries	Basic												
		Pollution	Basic				√				√				√
		Gas processing	Basic			√				√			√		

	chE4141	**equipment design1**	**Basic**				**√**				**√**			**√**	
		equipment design11	**Basic**				**√**				**√**				**√**
		Catalyst	**Basic**			**√**				**√**				**√**	

Course Description Form

Third stage:

1. Course name
Heat transfer I
2. Course Code
3. Semester / year
Semester I / year 2024-2025
4. Description Preparation Date
2025
5. Available Attendance Forms
Weekly
6. Number of credit hours (total) / Number of units (total)
60/6
7. Course administrator`s name (mention all, if more than one name)
Name: Tahseen Ali Hussein AlHattab Email: alhattab.t@uobabylon.edu.iq
8. Course Objectives
The objective of the course is to give third year chemical engineering students the fundamental physics of heat transfer by conduction, convection and radiation.
9. The objective of the course is to give third year chemical engineering students the fundamental physics of heat transfer by conduction, convection and radiation.
– Starting with real-world examples to draw students in. – Using visuals, activities, and case studies to make learning engaging. – Focusing on understanding concepts, not just memorizing formulas. – Giving students practical problems to solve. – Encouraging collaboration and peer learning. – Using technology and connecting heat transfer to other subjects.
10. Course Structure

Week	Hours	Required learning outcomes	Unit or subject name	Learning methods	Evaluation method
1	4	Concepts and Mechanism of heat flow, Modes of heat transfer, their physical mechanism,	introduction		
2	4	Laws of heat transfer, thermal conductivity, heat transfer coefficient, radiation heat transfer coefficient.	Modes of heat transfer		

3	4	Steady state heat conduction without heat generation in plane and composite wall, hollow cylinder.	One dimension steady state conduction		
4	4	Boundary conditions. Steady state heat conduction with heat generation in plane wall, cylinder and sphere.	Heat generation with the system		
5	4	Extended Surface: Types of fins, governing equation,	Fins, types of fins		
6	4	Fin performance, fin efficiency,overall fin effectiveness.	Fins, efficiency and performance		
7	4	Thermal contact resistance, critical thickness of insulation on cylindrical bodies.	contact resistance		
8	4	Steady state Two and Multi-dimensional heat conduction.	Two and higher dimensions steady state conduction		
9	4	Unsteady state heat conduction: lumped system	Unsteady state conduction		
11	4	Unsteady state heat conduction: Distributed Systems	-Distributed Systems		
12	4	Principle of heat convection: mechanism, natural and forced convection,	Convection heat transfer		
13	4	Convection boundary layers: laminar and turbulent, momentum and energy equations.	External flow :Laminar vs turbulent flow		
14	4	Laminar flow over bodies, turbulent flow inside circular and non-circular ducts,	Internal flow		
15	4	Reynolds Colburn analogy for flow over flat plate and flow inside tube, coefficient of friction and friction factor.	Reynolds Colburn analogy		

11. Course evaluation

Quizzes (10%). Lab. (10%), Mid. Exam (30%) and Final exam (50%)

12. Learning and Teaching Resources

Required textbooks (curricular books if any)	J. P. Holman, Heat Transfer, 10th ed., McGraw Hill
Main references (sources)	
Recommended books and references (scientific journals , reports..)	F. P. Incropera, Fundamentals of Heat and Mass Transfer
Electronic references , websites	https://sites.google.com/uobabylon.edu.iq/heat-transfer-virtual-lab/

1. Course name

Heat transfer II

2. Course Code

3. Semester / year

Semester II / year 2023-2024

4. Description Preparation Date

2025

5. Available Attendance Forms

Weekly

6. Number of credit hours (total) / Number of units (total)

60/6

7. Course administrator`s name (mention all, if more than one name)

Name: Tahseen AlHattab
Email: alhattab.t@uobabylon.edu.iq

8. Course Objectives

The objective of the course is to give third year chemical engineering students the fundamental physics of heat transfer by conduction, convection and radiation.

9. Teaching and Learning Strategies

- Starting with real-world examples to draw students in.
- Using visuals, activities, and case studies to make learning engaging.
- Focusing on understanding concepts, not just memorizing formulas.
- Giving students practical problems to solve.
- Encouraging collaboration and peer learning.
- Using technology and connect heat transfer to other subjects.

10. Course Structure

Week	Hours	Required learning outcomes	Unit or subject name	Learning methods	Evaluation method
1	4	Use of empirical and experimental correlations for forced convection.	Forced convection.	using white board and digital media to present the notes of each lecture	Quizzes, Class assignments, HomeWorks, Reports,
2	4	Natural convection over vertical and horizontal plans	Natural convection		
3	4	Natural convection in enclosure.	Natural convection in enclosure.		
4	4	Use of empirical and experimental correlations for natural convection.	Empirical and experimental correlations		
5	4	Principle of condensation and boiling.	Condensation and boiling.		
6	4	Thermal radiation: Concept, Black body radiation.	Radiation		

7	4	Spectral and total emissive power, Stefan Boltzmann law,	Emissive power in radiation		
8	4	Radiation laws, irradiation and radiosity, Surface absorption, reflection and transmission, emissivity,	Radiation proprieties		
9	4	Radiation view factor, radiation heat exchange between two diffuse gray surfaces, radiation shield.	View factor		
11	4	Gas radiation	Gas radiation		
12	4	Classification of heat exchangers, temperature distribution in parallel, counter flow arrangement	Heat Exchanger		
13	4	overall heat transfer coefficient, fouling factor,	OHTC		
14	4	Log-mean temperature difference method.	LMTD		
15	4	NTU –effectiveness method of analysis for rating and sizing of heat exchangers.	NTU-ε		

11. Course evaluation	
Quizzes (10%). Lab. (10%), Mid. Exam (30%) and Final exam (50%)	
12. Learning and Teaching Resources	
Required textbooks (curricular books if any)	J. P. Holman, Heat Transfer, 10th ed., McGraw Hill
Main references (sources)	
Recommended books and references (scientific journals , reports..)	F. P. Incropera, Fundamentals of Heat and Mass Transfer
Electronic references , websites	https://sites.google.com/uobabylon.edu.iq/heat-transfer-virtual-lab/

1. Course name
Mass Transfer-I
1. Course Code
2. Semester / year
First semester 2024-2025

3. Description Preparation Date	
30/03/2025	
4. Available Attendance Forms	
Classroom	
5. Number of credit hours (total) / Number of units (total)	
60 Hr.	
6. Course administrator`s name (mention all, if more than one name)	
Name: Assist.Prof. Sata Kathum A. Ajjam Email: eng.sata.kathum@uobabylon.edu.iq	
7. Course Objectives	
Course Objectives	1- The student will have the ability to define the Mass Transfer fundamentals and its application. 2- The student will be able to identify the mass transfer equipments and its type. 3_the student can be able to recognize each type of mass transfer application and the methods of its operation. 4- To learn the student how to design the equipment of mass transfer processes and make the material and energy balance of the units. 5- To learn the student how to solve the problem and the troubleshooting of chemical industries.
8. Teaching and Learning Strategies	
Course Objectives	A - Cognitive goals 1- To learn the student how to design the equipment of mass transfer processes and make the material and energy balance of the units. 2- To learn the student how to solve the problem and the troubleshooting of equipment's for chemical industries. 3- To learn the student how to solve the mass transfer problem of processes.
	b- The skills goals special to the course 1. The student will be able to desing the equipment of mass transfer application 2. The student will identify the problems and the troubleshooting of equipment that control its operation

9. Course Structure
10. Course evaluation 40m+ 60 for final
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..
11. Learning and Teaching Resources

Required textbooks (curricular books if any)	1-Coulson & Richardson's Chemical Engineering Solutions, Volume 2
Main references (sources)	1-Coulson & Richardson's Chemical Engineering Solutions, Volume 1 & 2
Recommended books and references (scientific journals , reports.)	2-Mass Transfer From Fundamentals to Modern Industrial Applications *Koichi Asano* Tokyo Institute of Technology 3- Mass transfer principles and applications DIRAN BASMADJIAN
Electronic references , websites	Google and Telegram and others

- course structure: first course

Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	4	Basic and Fundamentals of Mass Transfer	Reverse **الانتشار المتعاكس** Diffusion **الانتشار خلال الطبقة الساكنة** Diffusion through stagnant layer.	Explaining and projecting on digital screen	
week (2)	4	Basic and Fundamentals of Mass Transfer	**معامل الانتشار**Coefficient of Diffusivity	Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report

week (3)		Basic and Fundamentals of Mass Transfer	Mass **نظريات انتقال الكتلة** Transfer Theory.	Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (4)	4	Basic and Fundamentals of Mass Transfer	Mass **نظريات انتقال الكتلة** Transfer Theory.	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (5)	4	Basic and Fundamentals of Mass Transfer	Mass Transfer **معامل انتقال الكتلة** Coefficient.	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (6)	4	*Gas Absorption*	**امتصاص الغاز**Gas Absorption. .	Method of giving lectures. Explaining on whiteboard and	Homework

				projecting on digital screen	
week (7)	4	*Mid exam* *Gas Absorption*	The **ارتفاع برج الأمتصاص وقطره** height of absorption tower		
week (8)	4	*Gas Absorption*	The type **أنواع أبراج الامتصاص** of absorption tower.	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
week (9)	4	*Gas Absorption*	The **كفاءة أبراج الامتصاص** efficiency of absorption tower.	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework
week (10)	4	Distillation	**التقطير** Distillation **طريقة ميكب-ثيل** Mc-Cabe Theile Method	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
week (11)	4	Distillation	**طريقة لويس-سوريل** Lewis-Sorel Method	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
week (12)	4	Distillation	**طريقة بونجون-سافورايت** Bonchon-Savarot M.	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
week (13)	4	Distillation	**التقطير الدفعي** Batch Distillation	Explaining on whiteboard and projecting on digital screen	Semester and daily exam
week (14)	4	Distillation	**التقطير للمزيج متعدد المكونات** Multicomponent Distilaation	Method of giving lectures. Drawing on the	Semester and daily exam

				board and drawing on the computer	
week (15)	4	Distillation Final Exam	التقطير للمزيج متعدد المكونات Multicomponent Distilaation		

12. Course name	
Mass Transfer-II	
13. Course Code	
14. Semester / year	
2nd semester 2024-2025	
15. Description Preparation Date	
18/01/2025	
16. Available Attendance Forms	
Classroom	
17. Number of credit hours (total) / Number of units (total)	
60 Hr.	
18. Course administrator`s name (mention all, if more than one name)	
Name: Assist.Prof. Sata Kathum A. Ajjam Email: eng.sata.kathum@uobabylon.edu.iq	
19. Course Objectives	
Course Objectives	1 The student will have the ability to define the Mass Transfer fundamentals and its application. 2- The student will be able to identify the mass transfer equipment's and its type. 3_the student can be able to recognize each type of mass transfer application and the

	methods of its operation. 4- To learn the student how to design the equipment of mass transfer processes and make the material and energy balance of the units. 5- To learn the student how to solve the problem and the troubleshooting of chemical industries.

20. Teaching and Learning Strategies

Course Objectives	A - Cognitive goals 1- To learn the student how to design the equipment of mass transfer processes and make the material and energy balance of the units. 2- To learn the student how to solve the problem and the troubleshooting of equipment's for chemical industries. 3- To learn the student how to solve the mass transfer problem of processes.
	b- The skills goals special to the course 1. The student will be able to desing the equipment of mass transfer application 2. The student will identify the problems and the troubleshooting of equipment that control its operation

- Course structure: first course

Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
week (1)	4	Liquid Extraction	الاستخلاص (سائل-سائل) Extraction	Explaining and projecting on digital screen	
week (2)	4	Liquid Extraction	حسابات الأستخلاص لحالة الذوبان الجزئي Extraction Calculation for partial misicible solvents	Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (3)		Liquid Extraction	حسابات الأستخلاص للسوائل الغير ذائبة Extraction Calculation for immmisicible solvents	Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report

week (4)	4	Liquid Extraction	**الأستخلاص الدفعي** Batch Ectraction	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (5)	4	Liquid Extraction	**الأستخلاص المستمر للجريان المتوازي والمتعاكس** Extraction Calculation for partial misicible solvents co-currenr	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
week (6)	4	Liquid Extraction	**الأستخلاص المستمر للجريان المتوازي والمتعاكس** Extraction Calculation for partial misicible solvents counter-currenr	Method of giving lectures. Explaining on whiteboard and projecting on digital screen	Homework
week (7)	4	*Mid exam* Humidification and Cooling Tower	**الترطيب وابراج التبريد والتجفيف** Humidification and Cooling Tower		
week (8)	4	*Drying*	**مراحل التجفيف** Drying	Explaining on whiteboard and projecting on digital screen	Homework Quizzes

first week (9)	4	*Drying*	**حسابات زمن التجفيف للمرحلتين الثابتة والتغيرة** Drying calculation for time periods	Method of giving lectures. Explaining on whiteboard and projecting on digital	Homework
first week (10)	4	Evaporation	**التبخير** Evaporation	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
first week (11)	4	Evaporation	**أنواع المبخرات** Types of Evaporators	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
first week (12)	4	Evaporation	**أنواع المبخرات** Types of Evaporators	Explaining on whiteboard and projecting on digital screen	Homework Quizzes
first week (13)	4	Evaporation	**المبخرات الأحادية والمتعددة** Single and Multi effect evaporator	Explaining on whiteboard and projecting on digital screen	Semester and daily exam
first week (14)	4	Adsorption	Adsorption	Method of giving lectures. Drawing on the board and drawing on the computer	Semester and daily exam
first week (15)	4	Adsorption Final Exam	Adsorption Mass and heat balance in evaporator.		

• Course evaluation 40m+ 60 for final	
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..	
• Learning and Teaching Resources	
Required textbooks (curricular books if any)	1-Coulson & Richardson's Chemical Engineering Solutions, Volume 2
Main references (sources)	1-Coulson & Richardson's Chemical Engineering Solutions, Volume 1 & 2
Recommended books and references (scientific journals , reports..)	2-Mass Transfer From Fundamentals to Modern Industrial Applications *Koichi Asano* Tokyo Institute of Technology 3- Mass transfer principles and applications DIRAN BASMADJIAN
Electronic references , websites	Google and Telegram and others

1. Course Name: Thermodynamics 1	
2. Course Code:CHE-00	
3. Semester / Year: 2024-2025	
4. Description Preparation Date: February 2025	
5. Available Attendance Forms: weekly	
6. Number of Credit Hours (Total) / Number of Units (Total) 45 hrs / 3 units	
7. Course administrator's name (mention all, if more than one name) Asst. Prof. Alaa Nour Ghanim Email: eng.alaaghanim@uobabylon.edu.iq	
Name: Email:	
8. Course Objectives	
Course Objectives	• Knowing and understanding the types of energy and how it is converted from one form to another and how the heat can be converted into useful work. Knowing and understanding the statements and the expressions of the thermodynamics laws I, II and III and their applications.

	• Know and understand pressure-volume-temperature relationships for pure gases and mixtures using different equations of state. Understanding and calculating energy and efficiency of heat engines, heat pumps, and equipment such as pumps, compressors, turbines • Acquire skills in pressure-volume-temperature calculations for systems of pure gases and mixtures

9. Teaching and Learning Strategies

Strategy	1- Using lectures and presentation through LCD with aid of theoretical and practical examples. 2- Conducting intellectual discussions and making participations for students. 3- Tutorial groups to solve thermodynamics exercises.

10. Course structure: first course

Week	Hours	Required Learning Outcomes	Unit/Subject name	Learning Method	Evaluation Method
first week (1)	3	Introduction to Chemical Engineering Thermodynamics	Introduction Scope of thermodynamics Dimensions and unit Force Temperature Volume Pressure	LCD lectures	Semester and daily exam
week (2)	3	Introduction to Chemical Engineering Thermodynamics	Work, energy Internal energy and Enthalpy System and surrounding State functions	LCD lectures	Semester and daily exam
week (3)	3	The First Law of Thermodynamics	Statement steady state non-flow systems steady state flow systems The reversible and irreversible processes	LCD lectures	Semester and daily exam

week (4)	3	The Ideal Gas	Closed System Processes Isometric process Isothermal process Isobaric process Adiabatic process Polytropic process	LCD lectures	Semester and daily exam
week (5)	3	Properties of Two Phase System	Phase Rule Equilibrium of two phase system Property Diagrams Steam Tables Applications	LCD lectures	Semester and daily exam
week (6)	3	The Flow Work Heat Capacity	The flow work Heat Capacity Effect of Temperature on heat capacity for ideal gas	LCD lectures	Semester and daily exam
week (7)	3	Heat of Reactions	The standard heat of formation The standard heat of reactions Effect of Temperature on the Standard Heat of Reaction	LCD lectures	Semester and daily exam
week (8)	3	The Second Law of Thermodynamics	Statement of the second law Carnot cycle Entropy and the second law	LCD lectures	Semester and daily exam
week (9)	3	The Second Law of Thermodynamics	Entropy change of ideal gas Evaluation of entropy Heat Engine and Heat Pump	LCD lectures	Semester and daily exam

week (10)	3	The Second Law of Thermodynamics	Heat Engines and Heat pumps	LCD lectures	Semester and daily exam
week (11)	3	PVT Relations of Pure Substance	Volumetric properties of pure fluid Law of corresponding states Generalized correlation of gases Cubic Equations	LCD lectures	Semester and daily exam
week (12)	3	PVT Relations of Pure Substance	Generalized virial correlations Generalized correlation of liquids PVT relations of liquid	LCD lectures	Semester and daily exam
week (13)	3	Heat Effects Accompanying Phase Changes of Pure Substance	Clapeyron equation Clausius-Clapeyron equation, Antoine equation, ΔH^v at normal boiling point	LCD lectures	Semester and daily exam
week (14)	3	Thermodynamics Relations	Maxwell Relations Derivations for Enthalpy & Entropy Exercises	LCD lectures	Semester and daily exam
week (15)	3	Thermodynamics Relations	Relations for isothermal compressibility and volume expansivity Throttling Process Examples	LCD lectures	Semester and daily exam

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

12. Learning and Teaching Resources
J. M. Smith and H.C. Van Ness "Introduction to Chemical Engineering Thermodynamics" 4Th Edition (1987), McGraw-Hill J. M. Smith and H.C. Van Ness "Introduction to Chemical Engineering Thermodynamics" 6Th Edition (2001), McGraw-Hill
Main references (sources) Sonntag, Borgnakke, Van Wylen, Fundamentals Thermodynamics, 7th Edition, Wiley India, N Delhi,2009

Recommended books and references (scientific journals, reports…)
I. M. Klotz and R. M. Rosenberg "Chemical Thermodynamics Basic Concepts and Methods" 2008, Published by John Wiley & Sons, Inc., Hoboken, New Jersey
Electronic References, Websites
httppuccini.che.pitt.edu~karljClassesCHE1007 https://folk.ntnu.no/skoge/septek/more-material/flash_from_skogestad_book.pdf https://www.thermopedia.com/content/1235/

1. Course Name: Thermodynamics 2
2. Course Code:CHE-00
3. Semester / Year: 2024-2025
4. Description Preparation Date: February 2025
5. Available Attendance Forms: weekly
6. Number of Credit Hours (Total) / Number of Units (Total) 45 hrs / 3 units
7. Course administrator's name (mention all, if more than one name) Asst. Prof. Alaa Nour Ghanim Email: eng.alaaghanim@uobabylon.edu.iq
Name: Email:
8. Course Objectives

Course Objectives	• Study the concept of the residual property to find the values of enthalpy and entropy for steady flow processes of real gases • Learn about refrigeration cycles and crygenic industrial applications • Acquire skills in power generation cycles of all kinds and calculate the efficiency • Introducing the student to the properties and types of solutions, defining the gas mixture model, the ideal solution model, and the liquid-vapor equilibrium mechanism. • Introducing the student to how to solve problems related to calculating thermodynamic properties, especially enthalpy and entropy, for pure gaseous, liquid,

	and solid materials, as well as for gaseous and liquid mixtures. • As well as learning about the concept of Fugacity and its applications in equilibrium

9. Teaching and Learning Strategies

Strategy	1- Using lectures and presentation through LCD with aid of theoretical and practical examples. 2- Conducting intellectual discussions and making participations for students. 3- Tutorial groups to solve thermodynamics exercises.

10. Course structure: second course

Week	Hours	Required Learning Outcomes	Unit/Subject name	Learning Method	Evaluation Method
first week (1)	3	Residual property	Residual Enthalpy Residual Entropy	LCD lectures	Semester and daily exam
week (2)	3	Steam power Cycles	Carnot Cycle Rankine cycle	LCD lectures	Semester and daily exam
week (3)	3	Steam power Cycles	Actual cycle	LCD lectures	Semester and daily exam
week (4)	3	Refrigeration	Introduction Carnot refrigeration	LCD lectures	Semester and daily exam
week (5)	3	Refrigeration	Vapor compression cycle	LCD lectures	Semester and daily exam
week (6)	3	Systems of variable composition	Gibbsian Equation Ideal gas mixture model Ideal solution model VLE and Chemical potential s	LCD lectures	Semester and daily exam
week (8)	3	Systems of variable composition	Henry law VLE from K-Value correlations	LCD lectures	Semester and daily exam

week (9)	3	Systems of variable composition	Flash calculations	LCD lectures	Semester and daily exam
week (10)	3	Partial molar property	Analytical solution Graphical solution	LCD lectures	Semester and daily exam
week (11)	3	Fugacity and fugacity coefficient	Fugacity Fugacity coefficient Fugacity of Gases From PVT Data Fugacity of Gases From Residual Property	LCD lectures	Semester and daily exam
week (12)	3	Fugacity of Mixturee	Lewis-Randall (LR) rule Henry Law (HL)	LCD lectures	Semester and daily exam
week (13)	3	Property change of mixing	Property change of mixing ΔM for ideal solution Excess Property	LCD lectures	Semester and daily exam
week (14)	3	Activity Coefficients	Activity Coefficients from VLE Data Evaluation of Activity Coefficients	LCD lectures	Semester and daily exam
week (15)	3	Chemical Reaction Equilibria	Chemical Reaction Equilibria	LCD lectures	Semester and daily exam

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

13. Learning and Teaching Resources

J. M. Smith and H.C. Van Ness "Introduction to Chemical Engineering Thermodynamics" 4Th Edition (1987), McGraw-Hill
J. M. Smith and H.C. Van Ness "Introduction to Chemical Engineering Thermodynamics" 6Th Edition (2001), McGraw-Hill

Main references (sources)

Sonntag, Borgnakke, Van Wylen, Fundamentals Thermodynamics, 7th Edition, Wiley India, N Delhi,2009

Recommended books and references (scientific journals, reports…)
I. M. Klotz and R. M. Rosenberg "Chemical Thermodynamics Basic Concepts and Methods" 2008, Published by John Wiley & Sons, Inc., Hoboken, New Jersey
Electronic References, Websites
httppuccini.che.pitt.edu~karljClassesCHE1007 https://folk.ntnu.no/skoge/septek/more-material/flash_from_skogestad_book.pdf https://www.thermopedia.com/content/1235/

1. Course Name: Corrosion
2. Course Code: chE3111
3. Semester / Year: 1semster
4. Description Preparation Date: 16/2/2025
5. Available Attendance Forms: weekly/theory
6. Number of Credit Hours (Total) / Number of Units (Total) : 4 units
7. Course administrator's name (mention all, if more than one name)
Name: dr. shaker saleh bahar Email: shaker.saleh@uomus.edu.iq
8. Course Objectives
Course Objectives Objectives of the study subject The course aims to educate and prepare the student by laying a correct and solid founda in knowing the most important basic rules for corrosion for Chemical engineering, learning about chemicals equations and their application in their fie how to benefit from them in various aspects, and studying topics .
9. Teaching and Learning Strategies

Strategy	1. The student is prepared to receive a solid scientific subject 2. The student learns how to benefit from the basic theoretical topics in chemica

	engineering And harnessed in material reaction kinetics corrosion . 3. - The student learns how to apply the scientific materials that have been take 5- Consolidating the scientific material correctly by conducting daily exams 6- Activating the student's role in understanding and benefiting from this mate to the maximum extent

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	The student understands the topic	Introduction	theory	quiz
2	22	The student understands the topic	Factors That Influence ıction corrosion Rate	theory	quiz
3	22	The student understands the topic	Expressing the Reaction corrosionRat	theory	quiz
4	2	The student understands the topic	pes of corrosion	theory	quiz
5	2	The student understands the topic	Factors effect on corrosion	theory	quiz
6	2	The student understands the topic	inhibitor	theory	quiz
7	2	The student understands the topic	Michanisims of corrosion	theory	quiz
8	2	The student understands the topic	Green inhibitor	theory	quiz
9	2	The student understands the topic	polarization	theory	quiz
10	2	The student understands the topic	potantiostat	theory	quiz
11	2	The student understands the topic	rbecks diagram	theory	quiz
12	2	The student understands the topic	application	theory	quiz
13		The student understands the topic	Linear polarization	theory	quiz

14		The student understands the topic	application	theory	quiz
15		The stud understands the topic	appilcation	theory	quiz

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 10 daily attendance, 10 quizes, 10 practical, 20 monthly, 50 final	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Corrosion and corrosion control Third Edition ulag
Main references (sources)	Fundamental of corrosion engineering fontana
Recommended books and references (scientific journals, reports…)	All coorosion books
Electronic References, Websites	web

1. Course name	
petroleum refinery engineering	
2. Course Code	
3. Course Code	
second semester / third year	
4. Description Preparation Date	
2024/ 3 / 30	
5. Available Attendance Forms	
Attendance	
6. Number of credit hours (total) / Number of units (total)	
Number of hours: 3 / units: 2	
7. Course administrator`s name (mention all, if more than one name)	
Email :hameed@uobabylon.edu.iq	Name Dr. Hameed Hussein Alwan
8. Course Objectives	
Identify methods of fractionating crude oil and ways to improve the properties that make	

it suitable for use by the consumer

9. Teaching and Learning Strategies

Lectures are given on the characterization of pure petroleum products that are used to fractionate oil and produce various petroleum products, and ways to improve their specifications. The lectures include clarification through explanation and description of the diagrams for each unit.

10 .Course Structure

Evaluation method	Learning method	Unit or subject name	Required learning outcomes	Hours	Week
Exercises, assignments, and exams	Lecture	Petroleum refinery – introduction	Fundamentals of the oil industry	3	1
Exercises, assignments, and exams	Lecture	Atmospherics distillation unit -1	Fundamentals of the oil industry	3	2
Exercises, assignments, and exams	Lecture	Atmospherics distillation unit -2	Fundamentals of the oil industry	3	3
Exercises, assignments, and exams	Lecture	Vacuum distillation unit	Fundamentals of the oil industry	3	4
Exercises, assignments, and exams	Lecture	Crude oil desalting	Fundamentals of the oil industry	3	5
Exercises, assignments, and exams	Lecture	Crude oil evaluation	Fundamentals of the oil industry	3	6
Exercises, assignments, and exams	Lecture	Reflux types	Fundamentals of the oil industry	3	7
Exercises, assignments, and exams	Lecture	Pipe still heaters	Fundamentals of the oil industry	3	8
Exercises, assignments, and exams	Lecture	Top and side temperature calculation	Fundamentals of the oil industry	3	9
Exercises, assignments, and exams	Lecture	Hydrotreatment	Fundamentals of the oil industry	3	10
Exercises, assignments, and exams	Lecture	Catalytic reforming	Fundamentals of the oil industry	3	11

Exercises, assignments, and exams	Lecture	Isomerization	Fundamentals of the oil industry	3	12
Exercises, assignments, and exams	Lecture	Coking -1	Fundamentals of the oil industry	3	13
Exercises, assignments, and exams	Lecture	Coking -2	Fundamentals of the oil industry	3	14
Exercises, assignments, and exams	Lecture	Product Blending	Fundamentals of the oil industry	3	15

10. Course evaluation 40m+ 60 for final

1st mid	2nd mid	Quiz		Final exam	Final grade
15	15	10	40	60	100

11. Larning and teaching resources

	Required textbooks (curricular books if any)
W.L. Nelson, Petroleum refinery engineering, fourth edition, McGraw-Hill Book Company , 1958. M.R.Riazi, characterization and properties of petroleum fractions , ASTM ,2005 M.A.Fahim, Fundamentals of petroleum refining , ELESVIER , 2010	Main references (sources)
	Recommended books and references (scientific journals , reports..)
Google and Telegram and others	Electronic references , websites

13. Course Name: Electrochemical Engineering
14.
15. Course Code: chE3211
16. Semester / Year: semester
17. Description Preparation Date: 16/2/2025
18. Available Attendance Forms: weekly/theory

19. Number of Credit Hours (Total) / Number of Units (Total) : 2 units

20. Course administrator's name (mention all, if more than one name)

Name: dr. shaker saleh bahar
Email: shaker.saleh@uomus.edu.iq

21. Course Objectives

Objectives of the study subject

The course aims to educate and prepare the student by laying a correct and solid foundation in knowing the most important basic rules for electrochemical engineering and chemical engineering, learning about equations and their application in their fields, how to benefit from them in various aspects, and studying topics Related to the most important applications, such as electrochemical reactor CSTR, PFER and energy balance calculations and fuel cells and batteries.

22. Teaching and Learning Strategies

Strategy	1. The student is prepared to receive a solid scientific subject 2. The student learns how to benefit from the basic theoretical topics in chemical engineering And harnessed in material reactor design. 3. - The student learns how to apply the scientific materials that have been taken 5- Consolidating the scientific material correctly by conducting daily exams 6- Activating the student's role in understanding and benefiting from this material to the maximum extent

23. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	The student understands the topic	Introduction in electrochemical eng	theory	quiz
2	22	The student understands the topic	BALANCE FROM TOICHIOMETRY	theory	quiz
3	22	The student understands the topic	Open circt	theory	quiz
4	2	The student understands the topic	polarizatio	theory	quiz
5	2	The student understands the topic	Types of cells	theory	quiz
6	2	The student understands the topic	thermodynamic	theory	quiz

7	2	The student understands the topic	Concentration over potential	theory	quiz
8	2	The student understands the topic	application	theory	quiz
9	2	The student understands the topic	Fuel cell	theory	quiz
10	2	The student understands the topic	batteries	theory	quiz
11	2	The student understands the topic	iconections and di	theory	quiz
12	2	The student understands the topic	pollution	theory	quiz
13		The student understands the topic	potentiostat	theory	quiz
14		The student understands the topic	glvanostat	theory	quiz
15		The stud understands the topic	application	theory	quiz

24. 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
10 daily attendance, 10 quizes, 10 practical, 20 monthly, 50 final

25. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Fundimantal of electrochemical eng
Main references (sources)	Electrochemistry
Recommended books and references (scientific journals, reports…)	All electrochemical books
Electronic References, Websites	web

1. Course name :-

English Language for Third Stage (New Headway Plus: Intermediate Students' Book)

2. Course Code :-

3. Semester / year :-	
Semester 2 2024-2025	
4. Description Preparation Date :-	
23/3/2025	
5. Available Attendance Forms:-	
Classroom	
6. Number of credit hours (total) / Number of units (total) :-	
30 hr	
7. Course administrator`s name (mention all, if more than one name) :-	
Name: Muna Mohammed Abbas Alkhateeb Email: basic.muna.moh@Uobabylon.edu.iq	
8. Course Objectives	
Course Objectives	1. The New Headway Plus : Intermediate Student's Book is designed to improve learners' English skills across listening, speaking, reading, and writing, with a strong focus on vocabulary, grammar, and communication s Language Skills Development 2. Grammar and Vocabulary 3. Functional Language Use 4. Pronunciation and Communication 5. Cultural Awareness and Critical Thinking strategies.
9. Teaching and Learning Strategies:-	
Course Objectives	The New Headway Plus :Intermediate Student's Book incorporates a variety of teaching and learning strategies to help students develop their English skills effectively. These strategies are designed to support different learning styles and enhance engagement in the classroom. 1. Communicative Approach 2. Task-Based Learning 3. Integrated Skills Approach 4. Grammar in Context 5. Lexical Approach (Vocabulary Building) 6. Pronunciation and Intonation Practice 7. Self-Study and Independent Learning 8. Collaborative and Peer Learning 9. Continuous Assessment and Feedback
10. Course Structure :-	

Week	Hours	Unit or subject name	Required learning outcomes	Learning mothed	Evaluation method

1	2	It's a wonderful world!	The "It's a Wonderful World!" unit explores topics related to nature, the environment, and appreciation of the world around us	The New Headway Plus / Intermediate course follows a communicative, interactive, and student-centered approach to language learning. It combines different teaching methodologies to develop learners' listening, speaking, reading, writing, grammar, and vocabulary skills effectively.	Homework Quizzes Report
2	2	Get happy	The "Get Happy!" unit focuses on happiness, well-being, and positive emotions.		
3	2	Telling tales	The "Telling Tales" unit focuses on storytelling, narrative techniques, and creative writing.		
4	2	Doing the right thing	The "Doing the Right Thing" unit focuses on ethics, moral decision-making, and values.		
5	2	On the move	The "On the Move" unit focuses on travel, transportation, and mobility, exploring how people move around the world.		
6	2	I just love it!	The "I Just Love It!" unit focuses on emotions, preferences, opinions, and expressing likes and dislikes.		
7	2	A world guide to Good Manners	The "A World Guide to Good Manners" unit focuses on cultural differences in etiquette, manners, and social norms across the world.		
8	2	Famous for not being Famous	The "Famous for Not Being Famous" unit explores the concept of celebrity, publicity, and the paradox of fame in modern culture		
9	2	The world of work	The "The World of Work" unit focuses on various aspects of professional life, including careers, job responsibilities, and workplace culture.		

10	2	Just imagine	The "Just Imagine" unit encourages students to explore imagination, creativity, and hypothetical scenarios through a range of thought-provoking tasks.		
11	2	Getting together	The "Getting Together" unit focuses on social interactions, relationships, and communication within various social settings..		
12	2	Obsessions	The "Obsessions" unit explores the topic of obsessions, passions, and intense interests in people's lives..		
13	2	Tell me about it!	The "Tell Me About It!" unit focuses on narrating experiences, sharing personal stories, and giving detailed accounts of past events.		
14	2	Life's great events!	The "Life's Great Events!" unit focuses on major life events such as weddings, birthdays, graduations, and celebrations, along with their impact and cultural significance.		
15	2	The end of the semester			

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..

12. Learning and Teaching Resources :-

Required textbooks (curricular books if any)	
Main references (sources)	*Liz and Soars,J. New Headway Plus: Intermediate Students' Book .*
Recommended books and references (Journals , reports..)	
Electronic references , websites	Google classroom, YouTube

13. Course name
Engineering analysis
14. Course Code
15. Semester / year
I 2023-2025
16. Description Preparation Date
2025
17. Available Attendance Forms
Weekly
18. Number of credit hours (total) / Number of units (total)
3/60
19. Course administrator`s name (mention all, if more than one name)
Name:Ali Obaid Imarah Email:aliumara@uobabylon.edu.iq
20. Course Objectives:

Course Objectives	The aim of this subject is to make the students ready to understand and comprehend the scientific theories and their applications related to their field of the study.

21. Teaching and Learning Strategies The objective of the course is to give third year chemical engineering students the fundamental of Engineering analysis

Course Objectives	

22. Course Structure

The engineering analysis course includes six chapters, respectively:
(1) Applications of differential equations of degree 1 and 2
(2) Instant differential equations.
(3) differential equations of with high order.
(4) Fourier transform.
(5) laplace's equation.
(6) mathematical model
(7) Partial Differential Equation (PDE)

Week	Hours	Required learning outcomes	Unit or subject name	Learning mothed	Evaluation method

1	4	Introduction of first order differential Equations	Introduction	Using whiteboard and digital Media presentation	Quizzes exams Report class assignment
2	4	Applications of Ordinary differential equation (ODE)			
3	4	Example and application of ODE			
4	4	Solving ODE By D-operator			
5	4	Mid exam 1			
6	4	solution by Series			
7	4	Example of Series Solve the ODE by Series			
8	4	Laplace transformation			
9	4	inverse Laplace transformation solution of differential equation using Laplace transformation			
10	4	Mid exam 2			
11	4	partial differential equations (PDE) Mathematical modeling (Heat transfer.			
12		mathematical modeling, Mass transfer, reactor)			
13		Reviewing			

23. Course evaluation

Quizzes (10) % , mid Exam ,(30)%, final exam (60)%

24. Learning and Teaching Resources

Required textbooks (curricular books if any)	Wicaksana and T. Rachman, HIGHER ENGINEERING, vol. 3, no. 1. 2018

Main references (sources)	
Recommended books and references (scientific journals , reports..)	
Electronic references , websites	

1. Course name	
Numerical analysis	
2. Course Code	
3. Semester / year	
II 2023-2025	
4. Description Preparation Date	
2025	
5. Available Attendance Forms	
Weekly	
6. Number of credit hours (total) / Number of units (total)	
3/60	
7. Course administrator`s name (mention all, if more than one name)	
Name: Dr Ali Safa Nouri Email:alsaeghali@uobabylon.edu.iq	
8. Course Objectives :	
Course Objectives	The objective of numerical analysis courses is to introduce the students to the extent to which numerical methods are needed for solving various scientific problems, and to train them to use these methods to find approximate solutions to the issues raised in various fields of research.
9. Teaching and Learning Strategies The objective of the course is to give third year chemical engineering students the fundamental of Numerical analysis .	
Course Objectives	
10. Course Structure The numerical analysis course includes six chapters, respectively: • Estimating errors • Solving nonlinear equations	

- interpolation
- Numerical integration
- Solving the systems of linear equations
- Introduction to the solution of ordinary differential equations.

Week	Hours	Required learning outcomes	Unit or subject name	Learning mothed	Evaluation method
1	4	Estimating errors in basic arithmetic operations as well as in functions (of single and multiple parameters). Accumulation of errors and calculating higher limits to reduce their inflation in recursive processes	Introduction	Using whiteboard and digital Media presentation	Quizzes exams Report class assignment
2	4	• Sources and types of errors. • Estimating errors in basic arithmetic operations. • Estimating errors in functions (of single and multiple parameters). • Accumulation of errors and calculating higher limits to reduce their inflation in recursive processes			
3	4	Using the most important numerical methods for solving nonlinear algebraic and transcendental equations with error calculation in each method. The undertaken methods are: Bisection method, Secant method and Newton's method.			
4	4	Using the most famous forms of interpolation such as Newton formula and			

		Lagrange formula in addition to the Least squares method. Reverse interpolation.			
5	4	Mid exam 1			
6	4	Numerical integration			
7	4	The use of the most important numerical rules in calculating the definite integrals and estimating the committed errors. • Rectangle rule • Trapezoidal rule • Simpson's rule.			
8	4	Solving systems of linear equation			
9	4	Introducing the most immediate and iterative methods used for solving the systems of linear equations, • LU method • Jacobi method • Gauss-Seidel method. • Convergence test			
10	4	Mid exam 2			
11	4	Introduction for solving ordinary differential equations			
12		Introduction to the simplest numerical methods for solving ordinary differential equations from the first and second order. • Euler method • Modified Euler method • Runge-Kutta method. • Successive derivation method • Successive			

		approximation method.			
13		Reviewing			

11. Course evaluation	
Quizzes (10) % , mid Exam ,(30)%, final exam (60)%	
12. Learning and Teaching Resources	
Required textbooks (curricular books if any)	Numerical Analysis, Richard L. Burden and J. Douglas Faires
Main references (sources)	Numerical Analysis , Steven T. Karris
Recommended books and references (scientific journals , reports.)	
Electronic references , websites	

1. Course Name: Reactor design
2. Course Code: chE3211
3. Semester / Year: semester
4. Description Preparation Date: 30/3/2025
5. Available Attendance Forms: weekly/theory
6. Number of Credit Hours (Total) / Number of Units (Total) : 3 units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. muataz mohammed sulaiman Email: eng.moataz.alchalabi@uobabylon.edu.iq
8. Course Objectives
Course Objectives Objectives of the study subject The course aims to educate and prepare the student by laying a correct and solid foundat in knowing the most important basic rules for reactor design Chemical engineering, learning about design equations and their application in their fie how to benefit from them in various aspects, and studying topics Related to the most important applications, such as batch reactor CSTR, PFR and ene balance calculations.
9. Teaching and Learning Strategies

Strategy	1. The student is prepared to receive a solid scientific subject 2. The student learns how to benefit from the basic theoretical topics in chemical engineering And harnessed in material reactor design. 3. - The student learns how to apply the scientific materials that have been taken 5- Consolidating the scientific material correctly by conducting daily exams 6- Activating the student's role in understanding and benefiting from this materia the maximum extent

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	The student understands the topic	- Introduction to Reactor Design Symbols and Relationship betweer CA and X,	theory	Quiz
2	4	The student understands the topic	Tutorial	theory	Quiz
3	4	The student understands the topic	- Ideal Reactors for a Single Reaction - IDEAL BATCH REACTOR - Space-Time and Space-Velocity STEADY-STATE MIXED FLOW REACTOR	theory	Quiz
4	4	The student understands the topic	- Steady-state plug flow reactor - Holding time and space time for flow reactors	theory	Quiz
5	4	The student understands the topic	Tutorial	theory	Quiz
6	4	The student understands the topic	امتحان	theory	quiz
7	4	The student understands the topic	- Design for Single Reactions - SIZE COMPARISON OF SINGLE REACTORS	theory	Quiz
8	4	The student understands the topic	- Multiple-reactor systems - Equal-size mixed flow reactors in series	theory	Quiz

9	4	The student understands the topic	- Mixed Flow Reactors of Different Sizes in Series	theory	Quiz
10	4	The student understands the topic	Reactors of Different Types in Series	theory	Quiz
11	4	The student understands the topic	Recycle reactor	theory	Quiz
12	4	The student understands the topic	Autocatalytic reactior	theory	Quiz
13	4	The student understands the topic	Reactor combination:	theory	Quiz
14	4	The student understands the topic	Tutorial	theory	Quiz
15	4	The stud understands topic	امتحان	theory	Quiz

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
5 daily attendance, 5 quizes, , 30 monthly, 40 final

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Chemical Reaction Engineering Third Edition Octave Levenspiel
Main references (sources)	Elements of Chemical Reaction engineering Fogler
Recommended books and references (scientific journals, reports...)	All reactor design books
Electronic References, Websites	Web

Fourth stage:

1. Course name	
Renewable Energy Resources	
2. Course Code	
3. Semester / year	
First / Fourth year BSc	
4. Description Preparation Date	
12/3/2025	
5. Available Attendance Forms	
Students attend regularly two theoretical hours weekly for 15 weeks	
6. Number of credit hours (total) / Number of units (total)	
30 theoretical hours / Two units	
7. Course administrator`s name (mention all, if more than one name)	
Name: Dr. Hassan Abdulzehra Alfetlawi Email: fetlawi@uobabylon.edu.iq	
8. Course Objectives	
Course Objectives	1. To discover the important of renewable energy. 2. To learn about the various types of renewable energy resources. 3. To find out the applications of the renewable energy. 4. To understand the impact of using renewable energy on the society.
9. Teaching and Learning Strategies	
Teaching and Learning Strategies	1- The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details. 2- The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture. 3-Brainstorming

10. Course Structure

Week	Hours	Required learning outcomes	Unit or subject name	Learning mothed	Evaluation method
15	30	- The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details. -The discussion method: Each item will be discussed with the students and allow them to give their opinion and comments about the whole parts of the lecture. - Brainstorming	1- Introduction 2- Renewable energy and Sustainability 3- Advantages and Drawback of Renewable Energy Sources 4- Solar Energy 5-Passive Solar 6-Direct Solar 7-Radiation 8-Flat Collectors 9-Concentrating Collectors 10-Photovoltaic Cells 11-Photovoltaic System 12-Wind Energy 13-Hydrolic Power 14-Biomass 15-Geothermal Power	1. The Presentation method: The teaching item in this method will be displayed in front of the students on the whiteboard in details . 2. The discussion method: Each item will be discussed with the students and allowing to them to give their opinion and comments about the whole parts of the lecture	- Decisions examinations 30 - Periodic examination 5 - Homework and Quizzes 5

11. Course evaluation

1- Decisions examinations	30
2- Periodic examination	5
3- Home work and Quizzes	5

12. Learning and Teaching Resources

Required textbooks (curricular books if any)	G.D. Rai, Non-Conventional Energy Sources,

	Khanna Publishers.2000.
Main references (sources)	S.P. Sukhatme, Solar Energy, Principles of Thermal Collection and Storage, Tata. Mc Graw Hill Publishers, Fourth Print, February 1989. - G.D. Rai, Solar Energy Utilizations, Khanna Publishers, Second Revised Edition, 1994. - Ronald Shaw, Wave Energy: A Design Challenge, Eills Horwood Ltd. Publishers, First Edition 1982. - Putnam, Energy from the Wind, Prentice Hall of India.2004.
Recommended books and references (scientific journals , reports..)	Open
Electronic references , websites	Classroom and Telegram program.

13. Course name
14.
Petrochemical Industries
15. Course Code
16. Semester / year
second semester 2023-2024
17. Description Preparation Date
1/0**4**/2025
18. Available Attendance Forms
Classroom
19. Number of credit hours (total) / Number of units (total)
45Hr.
20. Course administrator`s name (mention all, if more than one name)
Name: assistant lecturer Marwah Dawood Email: eng.marwa.dawood@uobabylon.edu.iq
21. Course Objectives

Course Objectives	1 Understanding Basic Processes in the Petrochemical Industry: Outline for a comprehens understanding of the business processes and techniques used in the production of petrochemical products such as chemical plastics II. 2. Vision of engineering concepts and skills: It gives the student the opportunity to apply t future concepts he has learned in solving specific economic projects in the field of petrochemicals. 3. Understand how to conduct reactions, purify materials, and separate them to reach a specific, high-purity product in accordance with international specifications and standards

22. Teaching and Learning Strategies

Course Objectives	A - Cognitive goals In the field of petrochemical industries, it aims to enhance students' understanding of complex industrial concepts and develop their practical skills in this field. Here are some common strategies that can be applied Case studies: Use case studies to present realistic scenarios to students about the challenges faced by the petrochemical industry, and encourage them to research and analyze. Use of technology: Using technology in learning such as multimedia, virtual simulation, and educational software to enhance students' interaction with academic materials and improve their educational experience. Field visits and practical training: Organizing visits for students to factories and industrial facilities to learn closely about the processes and technologies used in the petrochemical industry, in addition to providing practical training opportunities
	b- The skills goals special to the course 1 - acquires a skill in how to initiate the design of chemical processes 2 – acquire skills in knowledge of chemical processes and types of industrial units 3 - Acquire skills in design, maintenance, research and development, and operation of industrial units

364. Course structure: first course

Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
16	3	Introduction to Petrochemical Industry	Petrochemical Industry	Explaining and projecting on digital screen	Semester and daily exam
17	3	Basic Petrochemical Processes	Petrochemical Industry	Explaining and projecting on digital screen	Semester and daily exam

18	3	Hydrocarbon Intermediates Paraffinic Hydrocarbon Olefinic Hydrocarbon The Dienes	Hydrocarbon Intermediates	Explaining and projecting on digital screen	Semester and daily exam
19	3	Production of Olefins and Diolefins Production of Ethylene	Production of Olefins and Diolefins	Explaining and projecting on digital screen	Semester and daily exam
20	3	Production of Propylene	Production of Olefins and Diolefins	Explaining and projecting on digital screen	Semester and daily exam
21	3	Ethylene and its Derivatives OXIDATION OF ETHYLENE	Ethylene and its Derivatives	Explaining and projecting on digital screen	Semester and daily exam
22	3	Important Chemicals from Acetaldehyde	Ethylene and its Derivatives		
23	3	Propylene and its Derivatives OXIDATION OF PROPYLENE	Propylene and its Derivatives	Explaining and projecting on digital screen	Semester and daily exam
24	3	Mid term exam			
25	3	CHLORINATION OF PROPYLENE	Propylene and its Derivatives	LCD lectures	Semester and daily exam
26	3	Aromatics Production REACTIONS AND CHEMICALS OF BENZENE	Aromatics Production	Explaining and projecting on digital screen	Semester and daily exam
27	3	REACTIONS AND CHEMICALS OF TOLUENE	Aromatics Production	Explaining and projecting on digital screen	Semester and daily exam
28	3	Polymerization	Polymerization	Explaining and projecting	Semester and daily exam

				on digital screen	
29	3	Synthetic Polymers (Thermoplastic and Thermoset)	Synthetic Polymers **(**	Explaining and projecting on digital screen	Semester and daily exam
30	3	synthetic Polymers (Synthetic Rubber and Synthetic Fibers)	synthetic Polymers**(**	Explaining and projecting on digital screen	Semester and daily exam

10 Course evaluation 40m+ 60 for final

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

11 Learning and Teaching Resources

Required textbooks (curricular books if any)	Matar S., Hatch L.F, "Chemistry of PETROCHEMICAL PROCESSES ", 2nd Edition, Gulf Publishing Company, (1994).
Main references (sources)	Riegel's Handbook of Industrial Chemistry Handbook of Industrial Chemistry
Recommended books and references (scientific journals , reports..)	Uttam Ray Chaudhuri "Fundamentals of Petroleum and Petrochemical Engineering." University of Calcutta Calcutta, India, 2011**.**
Electronic references , websites	Google and others

2. Course name :-
Pollution
13. Course Code :-
14. Semester / year :-
Semester 2 2024-2025
15. Description Preparation Date :-
30/3/2025
16. Available Attendance Forms:-
Class Room
17. Number of credit hours (total) / Number of units (total) :-
30 hr

18. Course administrator`s name (mention all, if more than one name) :-

Name: Ahmed amer Al-salman
Email: ahmed.a.alsalman@uobabylon.edu.iq

19. Course Objectives

Course Objectives	This course aims to equip students with a solid understanding of pollution, covering sources, environmental impacts, monitoring techniques, regulatory frameworks, mitigation strategies, and sustainable practices. By course completion, students should analyze pollution cases, engage in discussions, and contribute to effective pollution management.

20. Teaching and Learning Strategies:-

Course Objectives	This course provides an overview of pollution, exploring its origins, effects on the environment, and preventive measures. Topics include pollution types, monitoring methods, and adherence to environmental regulations. Students will gain practical insights to address pollution challenges and promote sustainable solutions

21. Course Structure :-

Week	Hours	Unit or subject name	Required learning outcomes	Learning mothed	Evaluation method
1	3	An introductory lecture on the pollution processing course (full explanation of course subject degree distribution, exams, attendance). Introduction to pollution and define the types of pollution	The Presentation method: the contents will be displayed in front of the students on the whiteboard in detail . The discussion method: Each item will be discussed with the students and allowing them to give their opinions and comments about the whole parts of the lecture.	For all lectures : Explaining on whiteboard and projecting on digital screen	Homework Quizzes Report
2	3	Introduction on types and define the water pollution and properties and source of those types			
3	3	Complete the explanation of the properties and the calculation for each property			
4	3	Water Treatment 1			
5	3	Water Treatment 2			
6	3	Water Treatment 3			

7	3	Mid exam			
8	3	Filtration & Membrane Processes Technology			
9	3	Electrodialysis treatment (ED)			
10	3	Disinfection in Water Treatment			
11	3	Air pollution 1 type of pollution and sources			
12	3	Air pollution 2 Methods of Pollution Control			
13	3	Air pollution 3 Gaseous emissions Gaseous emissions control			
14	3	Soil pollution			
15	3	The end of the semester			

22. 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..

23. Learning and Teaching Resources :-

Required textbooks (curricular books if any)	
Main references (sources)	*Environmental Engineering Principles and Practice: Richard O. Mines, Jr. 2014*
Recommended books and references (scientific journals , reports..)	
Electronic references , websites	Google classroom, YouTube

1. Course name :-

Process Control I

2. Course Code :-

3. Semester / year :-

1st Semester/ 2023-2024

4. Description Preparation Date :-

11/3/2025

5. Available Attendance Forms :-

Attendance	
6. Number of credit hours (total) / Number of units (total) :-	
Number of hours 3 (3 theoretical)/ units 2	
7. Course administrator`s name (mention all, if more than one name) :-	
Name: Ali obaid imarah Email: aliumara@uobabylon.edu.iq	
8. Course Objectives :-	
Course Objectives	Identify the different types of systems and their main objectives Identify which variables need to be controlled and in which way
9. Teaching and Learning Strategies:-	
Course Objectives	Be familiar with chemical processes and the different types of control systems Be able to design a control system

10. Course Structure :-

Week	Hours	Required learning outcomes	Unit or subject name	Learning mothed	Evaluation method
1	3	Process Control	Revise of Laplace transfer	Explaining and projecting on digital screen	Homework Quizzes Report
2	3	Process Control	Modeling Tools For Process Dynamics	Explaining and projecting on digital screen	Homework Quizzes Report
3	3	Process Control	Ordinary Differential Equations (ODEs)	Explaining and projecting on digital screen	Homework Quizzes Report
4	3	Process Control	Types of forcing changes	Explaining and projecting on digital screen	Homework Quizzes Report
5	Tests and Evaluation				
6	3	Process Control	First Order Systems: Transfer Functions	Explaining and projecting on digital screen	Homework Quizzes Report
7	3	Process Control	Examples of First Order Systems	Explaining and projecting on digital screen	Homework Quizzes Report
8	3	Process Control	Examples of First Order Systems	Explaining and projecting on digital screen	Homework Quizzes Report
9	3	Process Control	First Order Systems: Response of First-Order	Explaining and projecting on digital screen	Homework Quizzes Report
10	Tests and Evaluation				

11	3	Process Control	First Order Systems: Response of First-Order	Explaining and projecting on digital screen	Homework Quizzes Report
12	3	Process Control	Linearization	Explaining and projecting on digital screen	Homework Quizzes Report
13	Tests and Evaluation				
14	3	Process Control	Methods to Determine the Time Constant	Explaining and projecting on digital screen	Homework Quizzes Report
15	3	Process Control	Capacitance	Explaining and projecting on digital screen	Homework Quizzes Report

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..
Course evaluation 40%, final exam 60%.

12. Learning and Teaching Resources :-

Required textbooks (curricular books if any)	Chemical process control, George Stephanopoulos
Main references (sources)	Process Systems Analysis and Control 3rd ed, Donald R. Coughanowr & Steven E. LeBlanc
Recommended books and references (scientific journals , reports..)	
Electronic references , websites	

1. Course name :-

Process Control II

2. Course Code :-

3. Semester / year :-

2nd Semester/ 2023-2024

4. Description Preparation Date :-

11/3/2025

5. Available Attendance Forms:-

Attendance

6. Number of credit hours (total) / Number of units (total) :-

Number of hours 4(2 theoretical + 2 lab.)/ units 3

7. Course administrator`s name (mention all, if more than one name) :-

Name: Ali obaid Imarah
Email: aliumara@uobabylon.edu.iq

8. Course Objectives :-

Course Objectives	Identify the different types of systems and their main objectives Identify which variables need to be controlled and in which way

9. Teaching and Learning Strategies:-

Course Objectives	Be familiar with chemical processes and the different types of control systems Be able to design a control system

10. Course Structure :-

Week	Hours	Required learning outcomes	Unit or subject name	Learning mothed	Evaluation method
1	5	Process Control	Response of First-Order Systems in Series (Noninteracting System)	Explaining and projecting on digital screen	Homework Quizzes Report
2	5	Process Control	Response of First-Order Systems in Series (Interacting System)	Explaining and projecting on digital screen	Homework Quizzes Report
3	5	Process Control	Higher-Order Systems: Second-Order and Transportation Lag	Explaining and projecting on digital screen	Homework Quizzes Report
4	5	Process Control	Higher-Order Systems: Response of Second-Order	Explaining and projecting on digital screen	Homework Quizzes Report
5	Tests and Evaluation				
6	5	Process Control	LINEAR CLOSED-LOOP SYSTEMS	Explaining and projecting on digital screen	Homework Quizzes Report
7	5	Process Control	Closed-Loop Transfer Functions	Explaining and projecting on digital screen	Homework Quizzes Report
8	5	Process Control	Types And Transfer Functions of Control Systems	Explaining and projecting on digital screen	Homework Quizzes Report
9	5	Process Control	Transient Response of Simple Control Systems	Explaining and projecting on digital screen	Homework Quizzes Report
10	Tests and Evaluation				
11	5	Process Control	System Stability	Explaining and projecting on digital screen	Homework Quizzes Report
12	5	Process Control	Root Locus	Explaining and projecting on digital screen	Homework Quizzes Report
13	Tests and Evaluation				

14	5	Process Control	Control System Design by Frequency Response	Explaining and projecting on digital screen	Homework Quizzes Report
15	5	Process Control	Controller Tuning and Process Identification	Explaining and projecting on digital screen	Homework Quizzes Report

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..
Course evaluation 50%, final exam 50%

12. Learning and Teaching Resources :-

Required textbooks (curricular books if any)	Chemical process control, George Stephanopoulos
Main references (sources)	Process Systems Analysis and Control 3rd ed, Donald R. Coughanowr & Steven E. LeBlanc
Recommended books and references (scientific journals , reports..)	
Electronic references , websites	

1. Course Name: equipment design1

2. Course Code: chE4141

3. Semester / Year: semester

4. Description Preparation Date: 16/2/2025

5. Available Attendance Forms: weekly/theory

6. Number of Credit Hours (Total) / Number of Units (Total) : 3 units

7. Course administrator's name (mention all, if more than one name)

Name: dr. shaker saleh bahar
Email: shaker.saleh@uomus.edu.iq

8. Course Objectives

Course Objectives

Objectives of the study subject

The course aims to educate and prepare the student by laying a correct and solid foundat in knowing the most important basic rules for equipment design

Chemical engineering, learning about design equations and their application in their fie how to benefit from them in various aspects, and studying topics

Related to the most important applications, such as designing pipes, tanks, , separat valves, with matter and energy balance calculations. using specialized programs for that, training students on them, such as the hysys program

9. Teaching and Learning Strategies

Strategy	1. The student is prepared to receive a solid scientific subject 2. The student learns how to benefit from the basic theoretical topics in chemical engineering And harnessed in material equipment design. 3. - The student learns how to apply the scientific materials that have been taken and compiled in this subject hysys 4. Learn how different computer applications work as a program 5- Consolidating the scientific material correctly by conducting daily exams 6- Activating the student's role in understanding and benefiting from this material to maximum extent

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
	2	The student understands the topic	Material balanc	theory	quiz
	22	The student understands the topic	Energy balance	theory	quiz
	22	The student understands the topic	Flow sheets	theory	quiz
	2	The student understands the topic	ck diagrams and codes	theory	quiz
	2	The student understands the topic	cost	theory	quiz
	2	The student understands the topic	Pipe design	theory	quiz
	2	The student understands the topic	valves	theory	quiz
	2	The student understands the topic	Material chose	theory	quiz

	2	The student understands the topic	pumps	theory	quiz
	2	The student understands the topic	applications	theory	quiz
	2	The student understands the topic	Tanks and vessels	theory	quiz
	2	The student understands the topic	Stress tension a corrosion	theory	quiz
		The student understands the topic	Liquid- liquid separator	theory	quiz
		The student understands the topic	Gas- lic separator	theory	quiz
		The student understa the topic	Solid – separators	theory	quiz

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
10 daily attendance, 10 quizes, 10 practical, 20 monthly, 50 final

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Coulson & Richardson's Chemical Engineering v6
Main references (sources)	Encyclopedia of Chemical Eng. Krik and Othmer .2Chemical industry, Shreef
Recommended books and references (scientific journals, reports...)	process plant design , Harker
Electronic References, Websites	web

26. Course Name: equipment design2

27. Course Code: chE4241

28. Semester / Year: semster

29. Description Preparation Date: 16/2/2025

30. Available Attendance Forms: weekly/theory

31. Number of Credit Hours (Total) / Number of Units (Total) : 2 units

32. Course administrator's name (mention all, if more than one name)

Name: dr. shaker saleh bahar
Email: shaker.saleh@uomus.edu.iq

33. Course Objectives

Course Objectives

Objectives of the study subject
The course aims to educate and prepare the student by laying a correct and solid foundat in knowing the most important basic rules for equipment design
Chemical engineering, learning about design equations and their application in their fie how to benefit from them in various aspects, and studying topics
Related to the most important applications, such as designing pipes, tanks, dry adsorption, separation, and distillation towers, with matter and energy balance calculations
In addition to designing heat exchangers and furnaces, using specialized programs for t and training students on them, such as the hysys program

34. Teaching and Learning Strategies

Strategy	1. The student is prepared to receive a solid scientific subject 2. The student learns how to benefit from the basic theoretical topics in chemical engineering And harnessed in material equipment design. 3. - The student learns how to apply the scientific materials that have been taken and compiled in this subject hysys 4. Learn how different computer applications work as a program 5- Consolidating the scientific material correctly by conducting daily exams 6- Activating the student's role in understanding and benefiting from this material to maximum extent

35. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
	2	The student understands the	Mixing equipm	theory	quiz

		topic			
	22	The student understands the topic	Heat transfer equipment	theory	quiz
	22	The student understands the topic	Heat exchanger design	theory	quiz
	2	The student understands the topic	Cooler equipme design	theory	quiz
	2	The student understands the topic	Dryer equipmer design	theory	quiz
	2	The student understands the topic	GAS LIQUID SEPARATORS	theory	quiz
	2	The student understands the topic	Distillation equipment	theory	quiz
	2	The student understands the topic	Absorption equipment	theory	quiz
	2	The student understands the topic	Plate hydraulic design	theory	quiz
	2	The student understands the topic	Packed column	theory	quiz
	2	The student understands the topic	Liquid solid separator	theory	quiz
	2	The student understands the topic	as solid separat	theory	quiz
		The student understands the topic	Liquid- liquid separator	theory	quiz

		The student understands the topic	Plant design	theory	quiz
		The student understa the topic	Plant design	theory	quiz

36. 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 10 daily attendance, 10 quizes, 10 practical, 20 monthly, 50 final	
37. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Coulson & Richardson's Chemical Engineering v6
Main references (sources)	Encyclopedia of Chemical Eng. Krik and Othmer .2Chemical industry, Shreef
Recommended books and references (scientific journals, reports...)	process plant design , Harker
Electronic References, Websites	web

• Course name
Chemical Industries
• Course Code
• Semester / year
First semester 2024-2025
• Description Preparation Date
2025/2/10
• Available Attendance Forms
Class Room
• Number of credit hours (total) / Number of units (total)
45Hr.
• Course administrator`s name (mention all, if more than one name)

Name: lecturer Marwah Dawood
Email: eng.marwa.dawood@uobabylon.edu.iq

- Course Objectives

Course Objectives	1. The student could understand the types of chemical processes that conducts the industry, as well as how could be applied and explain the types of chemical and physical equipment, separation and purification devices, and process flow charts that achieve the required production sectors. 2 . Knowing the method, steps and designs of chemical processes, starting from raw materials to obtaining the product. Understand how reactions are conducted, purify and separate materials to reach a specific product of high purity in accordance with international specifications and standards, as well as waste treatment or reuse in accordance with environmental requirements

- Teaching and Learning Strategies

Course Objectives	A - COGNITIVE GOALS 1.KNOWING AND UNDERSTANDING THE TYPES OF CHEMICALS AND THEIR CLASSIFICATION AS WELL AS KNOWING THE BASICS OF CHEMICAL PROCESSES AND INDUSTRIAL UNITS. 2. KNOWING AND UNDERSTANDING THE BASIC REQUIREMENTS OF THE CHEMICAL INDUSTRY AND WHAT ARE THE STEPS NEEDED TO ESTABLISH A SPECIFIC INDUSTRY IN THE PRODUCTION OF A CHEMICAL. 3. KNOWING AND UNDERSTANDING THE SPECIFICATION OF CHEMICALS IN TERMS OF SOURCES, PREPARATION, REQUIREMENTS AND PRODUCTION PROCEDURES. 4. KNOWING AND UNDERSTANDING THE TYPES OF CHEMICAL PRODUCTION FLOW SHEETS AND HOW TO PREPARE THEM. 5. KNOWING AND UNDERSTANDING THE TYPES OF REACTORS AND EQUIPMENT AND HOW COULD BE CHOSEN IN CHEMICAL PROCESSES. B- THE SKILLS GOALS SPECIAL TO THE COURSE 1 - ACQUIRES A SKILL IN HOW TO INITIATE THE DESIGN OF CHEMICAL PROCESSES 2 – ACQUIRE SKILLS IN KNOWLEDGE OF CHEMICAL PROCESSES AND TYPES OF INDUSTRIAL UNITS 3 - ACQUIRE SKILLS IN DESIGN, MAINTENANCE, RESEARCH AND DEVELOPMENT, AND OPERATION OF INDUSTRIAL UNITS

364. Course structure: first course

Week	hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
first week (1)	3	Introduction to Chemical processes	Introduction	Explaining and projecting on digital	Semester and daily exam

				screen	
week (2)	3	Biotechnology	Biochemical engineering	Explaining and projecting on digital screen	Semester and daily exam
week (3)	3	Biotechnology	Fermenters & Applications	Explaining and projecting on digital screen	Semester and daily exam
week (4)	3	Industrial Gases	Air liquefaction Hydrogen production	Explaining and projecting on digital screen	Semester and daily exam
week (5)	3	Industrial Gases	Electrolytic Cells	Explaining and projecting on digital screen	Semester and daily exam
week (6)	3	Carbon and Coal Industry	Carbon Morphology And Types	Explaining and projecting on digital screen	Semester and daily exam
week (7)	3	Carbon and Coal Industry	Carbon black Activated carbon Graphite Gasifiers	Explaining and projecting on digital screen	Semester and daily exam
week (8)	3	Sulfuric Acid and Its Manufacture	Introduction The contact processes	Explaining and projecting on digital screen	Semester and daily exam
week (9)	3	Sulfuric Acid and Its Manufacture	Lead chamber process	Explaining and projecting on digital screen	Semester and daily exam
week (10)	3	Nitric acid and Its Manufacture	Na2NO3 process ARC process	LCD lectures	Semester and daily exam
week (11)	3	Nitric acid and Its Manufacture	Ammonia oxidation process	Explaining and projecting	Semester and daily exam

				on digital screen	
week (12)	3	Phosphoric Acid and Its Manufacture	Thermal process by Blast Furnace Thermal process by Electric Furnace	Explaining and projecting on digital screen	Semester and daily exam
week (13)	3	Phosphoric Acid and Its Manufacture	Wet process Engineering Aspects	Explaining and projecting on digital screen	Semester and daily exam
week (14)	3	Ammonia and Urea Production	Ammonia production	Explaining and projecting on digital screen	Semester and daily exam
week (15)	3	Ammonia and Urea Production	Urea production	Explaining and projecting on digital screen	Semester and daily exam

10 Course evaluation 40m+ 60 for final	
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..	
11 Learning and Teaching Resources	
Required textbooks (curricular books if any)	**Textbooks:** 1. Dryden, C.E, Outlines of Chemical technology, II Ed., Affiliate East-West press, 2003. 2. Mouljin, J.A., Makkee M., and Van Diepen, A.E., Chemical Process Technology, 2nd Edition, John Wiley & Sons Ltd, 2013.
Main references (sources)	Austin, G.T., Shreve's "Chemical Process Industries", 5th ed., McGraw-Hill, 1984.
Recommended books and references (scientific journals , reports..)	Srikumar Koyikkal,"Chemical Process Technology and Simulation", PHI Learning Ltd (2013).
Electronic references , websites	Google and others

23. Course name

Gas processing

24. Course Code

25. Semester / year

Semester 1 2024-2025

26. Description Preparation Date

3/9/2024

27. Available Attendance Forms

Class Room

28. Number of credit hours (total) / Number of units (total)

30 hr

29. Course administrator`s name (mention all, if more than one name)

Name: Farah Aziz Al-Saadi
Email: eng.farah.aziz@uobabylon.edu.iq

30. Course Objectives

Course Objectives	Let the students know the basics of Natural-gas processing, which is a range of industrial processes designed to purify raw natural gas by removing impurities, contaminants, and higher molecular mass hydrocarbons to produce what is known as pipeline-quality dry natural gas.

31. Teaching and Learning Strategies

Course Objectives	In this course, the student will develop an understanding of the source of natural gas and how it formed and will understand the treatment methods of natural gas and why it has been processed. Furthermore, the student will be able to know the transportation of Natural gas and the ways of NG measurement

32. Course Structure

Week	Hours	Unit or subject name	Required learning outcomes	Learning mothed	Evaluation method
1	3	An introductory lecture on the natural gas processing course (full explanation of course subject degree distribution, exams, attendance).	The Presentation method: the contents	For all lectures : Explaining on whiteboard	Homework Quizzes Report

		Introduction on Natural gas and define the composition of natural gas	will be displayed in front of the students on the whiteboard in .detail The discussion method: Each item will be discussed with the students and allowing to them to give their opinions and comments about the whole parts of the lecture.	and projecting on digital screen	
2	3	Introduction on Natural gas and define the composition properties and source of natural gas			
3	3	Complete the explanation of the properties and the calculation for each property			
4	3	Separation process: Types of Separators, Separator designer			
5	3	Dehydration process			
6	3	Dehydration: methods and calculation Dehydration systems used in the natural gas industry fall into four categories in principle: (a) Direct cooling (b) Compression followed by cooling (c) Adsorption (d) Absorption			
7	3	Mid exam			
8	3	Natural Gas Sweetening (Acid Gases Removal)			
9	3	Hydrocarbon Recovery Processes: What Are Natural Gas Liquids, NGL Extraction			
10	3	Natural Gas Liquid Fractionation (stabilizer)			
11	3	Natural gas			

		transportation: Pipeline, CNG Transportation, Gas Compression			
12	3	Liquefied Natural Gas (LNG)			
13	3	Flow measurement: Orifice Plates, Recording Charts			
14	3	Natural Gas Liquid Measurement			
15	3	Continuing to introduce the student to how to apply the examples given to them in the previous lectures on the gas processing			

33. 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..

34. Learning and Teaching Resources

Required textbooks (curricular books if any)	
Main references (sources)	Fundamentals of Natural Gas Processing" by Arthur J. Kidnay and William R. Parrish (2006) Natural Gas Processing. Technology and Engineering Design by Alireza Bahadori 2014 Advanced natural gas engineering by Wang, Xiuli, and Michael Economides. Elsevier, 2009.
Recommended books and references (scientific journals , reports..)	
Electronic references , websites	Google classroom, YouTube

2. Course name
Catalyst
3. Course Code
4. Course Code
second semester / fourth year

5. Description Preparation Date	
30/3/2025	
6. Available Attendance Forms	
attendance	
7. Number of credit hours (total) / Number of units (total)	
Number of hours: 2 / units: 2	
8. Course administrator`s name (mention all, if more than one name)	
Email :hameed@uobabylon.edu.iq	Name Dr. Hameed Hussein Alwan
9. Course Objectives	
Identify the role of catalyst and methods of catalytic chemical reactions in various chemical industries	
10. Teaching and Learning Strategies	
Lectures are given on the definition of catalyst and their role in catalyzing chemical reactions, their types, manufacturing methods, and characterization techniques used.	
10 .Course Structure	

Evaluation method	Learning method	Unit or subject name	Required learning outcomes	Catalyst Hours	Week
Exercises, assignments, and exams	Lecture	Catalyst definition	Basics of chemical reactions + techniques used in examining materials	2	1
Exercises, assignments, and exams	Lecture	Types of catalyst	Basics of chemical reactions + techniques used in examining materials	2	2
Exercises, assignments, and exams	Lecture	Chemical and physical adsorption	Basics of chemical reactions + techniques used in examining materials	2	3
Exercises, assignments, and exams	Lecture	Adsorption isotherm	Basics of chemical reactions + techniques used in examining materials	2	4
Exercises, assignments, and exams	Lecture	Catalyst components	Basics of chemical reactions + techniques used in examining materials	2	5
Exercises, assignments, and exams	Lecture	Catalyst preparation – precipitation	Basics of chemical reactions + techniques used in examining materials	2	6

Exercises, assignments, and exams	Lecture	Catalyst preparation – ion exchange	Basics of chemical reactions + techniques used in examining materials	2	7
Exercises, assignments, and exams	Lecture	Drying – rate of drying	Basics of chemical reactions + techniques used in examining materials	2	8
Exercises, assignments, and exams	Lecture	Washing and filtration	Basics of chemical reactions + techniques used in examining materials	2	9
Exercises, assignments, and exams	Lecture	Calcination and formulating	Basics of chemical reactions + techniques used in examining materials	2	10
Exercises, assignments, and exams	Lecture	Catalyst characterization	Basics of chemical reactions + techniques used in examining materials	2	11
Exercises, assignments, and exams	Lecture	Surface are calculation	Basics of chemical reactions + techniques used in examining materials	2	12
Exercises, assignments, and exams	Lecture	XRD	Basics of chemical reactions + techniques used in examining materials	2	13
Exercises, assignments, and exams	Lecture	Pore analysis	Basics of chemical reactions + techniques used in examining materials	2	14
Exercises, assignments, and exams	Lecture	Catalyst application	Basics of chemical reactions + techniques used in examining materials	2	15

11. Course evaluation 40m+ 60 for final

1st mid	2nd mid	Quiz		Final exam	Final grade
15	15	10	40	60	100

12. Larning and teaching resources

	Required textbooks (curricular books if any)
• James T. Richardson , Principles of catalyst development , Springer Science , 1989	Main references (sources)
	Recommended books and references (scientific journals ,

	reports..)
365. Google and Telegram and others 366. https://nptel.ac.in/	Electronic references , websites

35. Course name					
Unit Operation					
36. Course Code					
37. Semester / year					
2024- 2025					
38. Description Preparation Date					
31- 3 -2025					
39. Available Attendance Forms					
Attendance in the hall					
40. Number of credit hours (total) / Number of units (total)					
5 hr. (3 theoretical and 2 experimental) 3 unit					
41. Course administrator`s name (mention all, if more than one name)					
Name :Kadhim F. Alsultani Email:finteelalsultani@gmail.com					
42. Course Objectives					
Course Objectives	1- To important basic concepts of chemical technology. 2- To develop understanding about unit process and unit operations in various industries				
43. Teaching and Learning Strategies					
Course Objectives	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes				
44. Course Structure					
Week	Hours	Required learning outcomes	Unit or subject name	Learning mothed	Evaluation method
1	5	Unit Operation	Introduction to unit operations	Normal Lecture	Homework Quizzes, Report

2	5	Unit Operation	Momentum, Heat & Mass Transfer	Normal Lecture	Homework, Quizzes, Report
			Reynolds Analogy for Heat and Mass Transfer	Normal Lecture	Homework Quizzes, Report
3	5	Unit Operation	Boundary layer Theory	Normal Lecture	Homework Quizzes, Report
4	5	Unit Operation	Non Newtonian Fluid		Homework, Quizzes, Report
5	5	Unit Operation	Motion of particle in a fluids	Normal Lecture	Homework, Quizzes ,Report
6	5	Unit Operation	Fluid Flow Through Granular Bed and Packed columns	Normal Lecture	Homework, Quizzes , Report
7	5	Unit Operation	Fluid Flow Through Granular Bed and Packed columns	Normal Lecture	Homework, Quizzes ,Report
			Sedimentation	Normal Lecture	Homework, Quizzes ,Report
8	5	Unit Operation	Fluidization	Normal Lecture	Homework, Quizzes, Report
9	5	Unit Operation	Liquid filtration	Normal Lecture	Homework, Quizzes ,Report
10	5	Unit Operation	Membrane separation process	Normal Lecture	Homework, Quizzes ,Report
11	5	Unit Operation	Centrifugal process	Normal Lecture	Homework, Quizzes ,Report
12	5	Unit Operation	Crushing and grinding	Normal Lecture	Homework, Quizzes ,Report
13	5	Unit Operation	Cooling towers	Normal Lecture	Homework, Quizzes ,Report
14	5	Unit Operation	drying	Normal Lecture	Homework, Quizzes ,Report

15	5	Unit Operation			

45. Course evaluation

Course evaluation 50% and final exam 50%

46. Learning and Teaching Resources

Required textbooks (curricular books if any)	
Main references (sources)	• 1-Martin W.L., Introduction to particle technology, 2 edition , John Wiley & Sons Ltd.,2008 • 2- McCabe W.L., Smith J.M & Richardson J.C., Harriott P., Unit operation of chemical engineering , fifth edition, McGraw Hill, 1993. • 3- Coulson J.M. & Richardson J. F. , Chemical engineering , volume 1 , Six edition , ELBS, Pergamon Press. 2002 4- Coulson J.M. & Richardson J. F. , Chemical engineering , volume 2 , fifth edition , ELBS, Pergamon Press. 2002
Recommended books and references (scientific journals , reports..)	
Electronic references , websites	

1. Course name
Nanotechnology
2. Course Code
CHE424
3. Course Code
Second semester / Fourth year
4. Description Preparation Date

1/04/2024	
5. Available Attendance Forms	
attendance	
6. Number of credit hours (total) / Number of units (total)	
Number of hours: 2 (2 theoretical) / units: 2	
7. Course administrator`s name (mention all, if more than one name)	
Email : Eng.haneen.zuhair@uobabylon.edu.iq	Name Dr. Haneen Zuhair Naji
8. Course Objectives	
After learning the course the students should be able: 1. Understand bulk and Nanostructured materials. 2. Understand synthesis of nanomaterial with different. 3. Understand the basic principal of various characterization technique. 4. Understand the use of nanoscience and nanotechnology for various applications. 5. Students can understand the difficulties in synthesizing Nano particles and can work in the field of commercialization of Nano materials	
9. Teaching and Learning Strategies	
The course will start with fundamental concepts and then proceed to nanoscale phenomena and properties. This will be followed by discussions on the synthesis and self-assembly of nanomaterials and methods for their characterization. Emerging and potential applications of nanomaterials will be considered in the final segment of the course.	
10. Course Structure	

Evaluation method	Learning method	Unit or subject name	Required learning outcomes	Hours	Week
Exercises, assignments and exams	Lecture	Introduction	Introduction to the history of Nanotechnology Concept	3	1
Exercises, assignments and exams	Lecture	Introduction	Definition of nanotechnology, Nanoscience and materials science, the difference between them, classification of Nanomaterials .	3	2
Exercises, assignments and exams	Lecture	Natural Nanomaterials	Meaning of Natural nanomaterials, Types of natural Nanomaterials	3	3

Exercises, assignments and exams	Lecture	Synthesized Process of Nanoparticles	Types of synthesis process of nanomaterials and the different between them, Top down and bottom up approaches	3	4
Exercises, assignments and exams	Lecture	Top- down approaches	Types of Top-down approaches, Types of milling process, advantages and disadvantages	3	5
Exercises, assignments and exams	Lecture	Bottom-up approaches	Types of Bottom-up approaches, Their names according to the precursor nature	3	6
Exercises, assignments and exams	Lecture	Bottom-Up approaches	Sol-gel process, Sonochemical Process, Micelles and Microemulsion process	3	7
Exercises, assignments and exams	Lecture	Bottom-Up approaches	Co-precipitations process, Solvothermal Process	3	8
Exercises, assignments and exams	Lecture	Bottom-Up approaches	Types of Chemical vapor deposition process (CVD), Synthesis of graphene and CNT	3	9
Exercises, assignments and exams	Lecture	Nanomaterial characterization techniques	Scanning and Transmission Electron Microscopy	3	10
Exercises, assignments and exams	Lecture	Nanomaterial characterization techniques	Scanning Probe Microscopies: Atomic Force, scanning tunneling microscopy Diffraction and scattering techniques	3	11
Exercises, assignments and exams	Lecture	Properties and Size dependence of properties	Chemical Optical, vibrational, thermal	3	12

			Electrical,		
Exercises, assignments and exams	Lecture	Properties and Size dependence of properties	Magnetic Mechanical Theoretical Aspects-e.g. density functional theory	3	13
Exercises, assignments and exams	Lecture	Applications	Nano-electronics Nano optics Nanoscale chemical- and bio-sensing	3	14
Exercises, assignments and exams	Lecture	Applications	Photovoltaic, fuel cells, batteries and energy-related applications High strength nanocomposites Nanoenergetic materials	3	15

11. Course evaluation 40m+ 60 for final

1st mid	2nd mid	Quiz	lab		Final exam	Final grade
15	15	10	-	40	60	100

12. Larning and teaching resources

	Required textbooks (curricular books if any)
1. Nanotechnology for Chemical Engineers by Said Salaheldeen Elnashaie, Firoozeh Danafar, Hassan Hashemipour Rafsanjani, 2015.	Main references (sources)
Nanostructures and Nanomaterials: Synthesis, Properties and Applications by G. Cao, Imperial College Press, 2004. 2- Nanoscale Science and technology by Robert Kelsall (editor), Ian W. Hamley (co-editor), Mark Geoghegan (co-editor) , ISBN: 978-0-470-85086-2 3- The Chemistry of Nanomaterials: Synthesis, Properties and Applications by C. N. R. Rao, A. Muller, A. K. Cheetham, WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim, ISBN: 3-527-30686-2. 4- 4. Nanoscale Materials in Chemistry Edited by Kenneth J. Klabunde, John Wiley & Sons, Inc., ISBNs: 0-471-38395-3 (Hardback); 0-471-22062-0. 5- Textbook of Nanoscience and Nanotechnology, B.S. Muty, P. Shankar, Baldev Raj, B.B Rath and James Murday, University Press, IIM (ISBN-978 81 7371 738 3). 6- Introduction to Nanotechnology by Charles P. Poole Jr and. Frank J. Owens, Wiley-Inter science, 2003	Recommended books and references (scientific journals , reports..)

Google and Telegram and others	Electronic references , websites

3. Course name :-	
English Language for Fourth Stage (New Headway Plus/ Upper- Intermediate Students' Book)	
24. Course Code :-	
25. Semester / year :-	
Semester 2 2024-2025	
26. Description Preparation Date :-	
23/3/2025	
27. Available Attendance Forms:-	
Classroom	
28. Number of credit hours (total) / Number of units (total) :-	
30 hr	
29. Course administrator`s name (mention all, if more than one name) :-	
Name: Dr Ali Safa Nouri Email: alsaeghali@Uobabylon.edu.iq	
30. Course Objectives	
Course Objectives	The New Headway Plus /Upper-Intermediate Student's Book is designed to help students develop their English language skills at an upper-intermediate level (B2 according to the CEFR). The course objectives typically include: 1. Language Skills Development 2. Grammar and Vocabulary 3. Functional Language Use 4. Pronunciation and Communication 5. Cultural Awareness and Critical Thinking
31. Teaching and Learning Strategies:-	
Course Objectives	The New Headway Plus /Upper-Intermediate Student's Book incorporates a variety of teaching and learning strategies to help students develop their English skills effectively. These strategies are designed to support different learning styles and enhance engagement in the classroom. 1. Communicative Approach 2. Task-Based Learning 3. Integrated Skills Approach

	4. Grammar in Context 5. Lexical Approach (Vocabulary Building) 6. Pronunciation and Intonation Practice 7. Self-Study and Independent Learning 8. Collaborative and Peer Learning 9. Continuous Assessment and Feedback

32. Course Structure :-

Week	Hours	Unit or subject name	Required learning outcomes	Learning mothed	Evaluation method
1	2	No place like home	he unit "No Place Like Home" focuses on themes related to homes, lifestyles, culture, and personal experiences. By the end of this unit	he New Headway Plus Upper-Intermediate course follows a communicative, interactive, and student-centered approach to language learning. It combines different teaching methodologies to develop learners' listening, speaking, reading, writing, grammar, and vocabulary skills effectively.	Homework Quizzes Report
2	2	Been there, done that!	The "Been There, Done That!" unit focuses on experiences, travel, achievements, and storytelling.		
3	2	What a story!	The "What a Story!" unit focuses on storytelling, past events, and narrative structures		
4	2	Nothing but the truth	The "Nothing but the Truth" unit focuses on truth, lies, honesty, deception, and reporting facts.		
5	2	An eye to the future	The "An Eye to the Future" unit focuses on future predictions, technology, career aspirations, and global changes		
6	2	Making it big	The "Making It Big" unit focuses on success, ambition, career goals, and achieving personal and professional milestones		
7	2	Getting on together	The "Getting on Together" unit focuses on relationships,		

			teamwork, communication, and conflict resolution		
8	2	Going to extremes	The "Going to Extremes" unit focuses on extreme situations, risk-taking, adventurous activities, and the psychology of extreme behavior		
9	2	Thing aren't what they used to be!	The "Things Aren't What They Used to Be!" unit focuses on change, nostalgia, personal reflection, and societal transformation		
10	2	Risking life and limb	The "Risking Life and Limb" unit focuses on dangerous activities, risk-taking behavior, and extreme sports, as well as the psychology behind people's decisions to engage in such activities.		
11	2	In your dreams	The "In Your Dreams" unit focuses on dreams, aspirations, the subconscious, and imagining the future.		
12	2	It's never too late	The "It's Never Too Late" unit focuses on second chances, personal growth, overcoming challenges, and making life changes at any age.		
13	2	The world's top Conspiracy theories	The "The World's Top Conspiracy Theories" unit focuses on popular conspiracy theories, critical thinking, skepticism, and understanding how information spreads		
14	2	How ambitious are you?	The "How Ambitious Are You?" unit focuses		

15	2	The end of the semester	on ambition, personal goals, success, and the drive to achieve.		

33. 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..

34. Learning and Teaching Resources :-

Required textbooks (curricular books if any)	
Main references (sources)	*Liz and Soars,J. New Headway Plus:Upper-Intermediate Students' Book (3rd Ed.)*
Recommended books and references (scientific journals , reports..)	
Electronic references , websites	Google classroom, YouTube