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 educational program is a well-planned set of courses that include procedures and experiences arranged in the form of an academic syllabus. Its main goal is to improve and build graduates' skills so they are ready for the job market. The program is reviewed and evaluated every year through internal or external audit procedures and programs like the External Examiner Program.

The academic program description is a short summary of the main features of the program and its courses. It shows what skills students are working to develop based on the program's goals. This description is very important because it is the main part of getting the program accredited, and it is written by the teaching staff together under the supervision of scientific committees in the scientific departments.

This guide, in its second version, includes a description of the academic program after updating the subjects and paragraphs of the previous guide in light of the updates and developments of the educational system in Iraq, which included the description of the academic program in its traditional form (annual, quarterly), as well as the adoption of the academic program description circulated according to the letter of the Department of Studies T 3/2906 on 3/5/2023 regarding the programs that adopt the Bologna Process as the basis for their work.

In this regard, we can only emphasize the importance of writing an academic programs and course description to ensure the proper functioning of the educational process.

Concepts and terminology:

Academic Program Description: The academic program description provides a brief summary of its vision, mission and objectives, including an accurate description of the targeted learning outcomes according to specific learning strategies.

Course Description: Provides a brief summary of the most important characteristics of the course and the learning outcomes expected of the students to achieve, proving whether they have made the most of the available learning opportunities. It is derived from the program description.

Program Vision: An ambitious picture for the future of the academic program to be sophisticated, inspiring, stimulating, realistic and applicable.

Program Mission: Briefly outlines the objectives and activities necessary to achieve them and defines the program's development paths and directions.

Program Objectives: They are statements that describe what the academic program intends to achieve within a specific period of time and are measurable and observable.

Curriculum Structure: All courses / subjects included in the academic program according to the approved learning system (quarterly, annual, Bologna Process) whether it is a requirement (ministry, university, college and scientific department) with the number of credit hours.

Learning Outcomes: A compatible set of knowledge, skills and values acquired by students after the successful completion of the academic program and must determine the learning outcomes of each course in a way that achieves the objectives of the program.

Teaching and learning strategies: They are the strategies used by the faculty members to develop students' teaching and learning, and they are plans that are followed to reach the learning goals. They describe all classroom and extracurricular activities to achieve the learning outcomes of the program.

Academic Program Description Form

University Name: University of Basrah

Faculty/Institute: Collage of Engineering

Scientific Department: Chemical Engineering

Academic or Professional Program Name:

Final Certificate Name: BSC

Academic System: courses

Description Preparation Date: 2025

File Completion Date: 10/09/2025

Signature: Signature: M.A.Ism

Head of Department Name: Scientific Associate Name:

Mohammed k kadhim Muner Ismail Abdel Jalil

Date: 10/09/2025 Date:

ce and University Performance

Director of the Quality Assurance and University Performance Department:

Date:

Signature:

University of Basrah College of Engineering Dean Office

أ.د. مشيد تركي رشيد

Approval of the Dean

1. Program Vision

To be a leading Chemical Engineering program that inspires innovation and supports sustainable development.

2. Program Mission

Deliver high-quality education combining theory and practice to prepare competent, ethical, and globally competitive graduates.

3. Program Objectives

Provide strong knowledge, practical skills, ethical values, and industry links to prepare graduates for professional and societal contributions.

4. Program Accreditation

Aligned with **ABET** and national quality standards, with continuous improvement and regular review.

5. Other external influences

Driven by higher education policies, industry demands, sustainability trends, technological advances, and societal needs.

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	6	12	2.5%	
College Requirements	9	32	13%	
Department Requirements	34	144	60%	

Summer Training		required		
Other				

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

1.Program Description

Year/Level	Course Code	Course Name	Credit Hours	
			theoretical	practical
Year/Level	**Course Code**	**Course Name**		
Level one/semester one	UOB101	English Language I	X	
	CHE101	Mathematics I	X	
	CHE102	Analytical Chemistry	X	X
	CHE103	Engineering Drawing & Process flow sheeting)	X	X
	CHE104	Chemical Engineering Principles I	X	
	UOB102	Democracy and human rights	X	
	CHE105	Engineering Mechanics & Workshop Technology	X	X
Level one/semester two	CHE106	Mathematics II	X	
	CHE107	Physics	X	
	CHE108	Organic Chemistry	X	X
	UOB103	Computer I	X	X
	CHE109	Chemical Engineering Principles II	X	
	CHE110	Strength of Materials	X	
	UOB104	Arabic Language I	X	
Level two/semester one	CHE201	Applied Mathematics I	X	
	CHE202	Fluid Mechanics I	X	X
	CHE203	Electrical Technologies	X	
	CHE204	Material and energy Balances I	X	
	UOB203	Computer II	X	X

	UOB201	English Language II	X	
	UOB205	The crimes of the Baath regime in Iraq	X	
Level two/semester two	CHE205	Applied Mathematics II	X	
	CHE206	Fluid Mechanics II	X	
	CHE207	Physical Chemistry	X	X
	CHE208	Fuels and Sustainable Energy	X	
	CHE209	Materials and Energy Balance II	X	
	CHE210	Environmental Pollution & Water Technologies	X	
	UOB204	Arabic Language II	X	
Level three/semester one	CHE311	Chemical Eng. Analysis I	X	
	CHE312	Heat Transfer I	X	X
	CHE313	Mass Transfer I	X	
	CHE314	Chemical Eng. Thermodynamics I	X	
	CHE315	Engineering Materials Properties	X	X
	CHE316	Petrochemical Engineering	X	
Level three/semester two	CHE321	Chemical Eng. Analysis II	X	
	CHE322	Heat Transfer II	X	
	CHE323	Mass Transfer II	X	
	CHE324	Corrosion Engineering	X	
	CHE325	Chemical Eng. Thermodynamics 2	X	
	CHE326	Chemical Industries	X	
Level four/semester one	CHE412	Unit Operation	X	X
	CHE413	Process Dynamics	X	
	CHE414	Equipment Design I	X	
	CHE415	Reactor design I	X	
	CHE416	Petroleum Refinery I	X	
	CHE417	Numerical Methods	X	
	E422	Projects Management & Ethics		X
	E422	**Projects**		X

		Management & Ethics		
Level four/semester two	E421	Engineering Project II		X
	CHE423	Transport Phenomena	X	
	CHE424	Process Control &Instrumentation	X	
	CHE425	Equipment Design II	X	
	CHE426	Reactor Design II	X	
	CHE427	Petroleum Refinery II	X	X
	CHE428	Optimization and Simulation	X	

8. Expected learning outcomes of the program	
Knowledge	
	Demonstrate solid knowledge in mathematics, sciences, and core chemical engineering principles.
Skills	
	• Design and conduct experiments, analyze and interpret data using modern tools. • Design chemical engineering systems and processes that consider safety, sustainability, and economic
Ethics	
	• Commit to professional ethics and social responsibility in chemical engineering practice. • Communicate effectively, work in multidisciplinary teams, and engage in lifelong learning.

9. Teaching and Learning Strategies

- Interactive lectures and problem-based learning.
- Laboratory sessions and practical experiments.
- Case studies, projects, and design assignments.
- Group discussions, teamwork, and presentations.
- Use of modern digital tools, simulations, and e-learning resources.

10. Evaluation methods

- Written exams (midterm and final).
- Quizzes and short assignments.
- Laboratory reports and practical performance.
- Project work and oral presentations.
- Continuous assessment, peer evaluation, and final comprehensive exam.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)	Number of the teaching staff	
	General	Special		Staff	Lecturer
Dr. Abdul Wahid Al-Hajjaj		x		x	
Dr. Alaa Abdul Razzaq Jassim		x		x	
Mohammed Nasser Fares		x		x	

Haifa Latif		x		x	
Rasul Mohammed Nasir		x		x	
Raed Abdul Hussein Diab		x		x	
Hassan Wathiq Ayoub		x		x	
Shaima Mahdi Shuaib		x		x	
Ahmed Shawqi Sadiq		x		x	
Anwar Abdul Hassan		x		x	
Wad Khaled Ghanem		x		x	
Shorouk Shabar Ghalib		x		x	
Nour Talib Jassim		x		x	
Ahlam Abdul Redha Hussein		x		x	
Ruwaida Mohammed Ali		x		x	
Nebras Raad Fajr		x		x	
Ghadeer Jassim Mohammed		x		x	
Taqi Aboud Mohsen Ali	x			x	
Maher Ismail Badran Saleh	x			x	

Professional Development

Mentoring new faculty members

- Orientation sessions on program vision, mission, and academic policies.
- Assigning senior faculty as mentors for guidance in teaching, research, and student advising.
- Providing training workshops on curriculum design, assessment methods, and use of digital tools.

Professional development of faculty members

- Continuous training through workshops, seminars, and conferences.
- Encouraging participation in research projects, publications, and industry collaboration.
- Regular evaluation and feedback sessions to enhance teaching effectiveness.
- Support for pursuing higher academic qualifications and international collaborations.

12. Acceptance Criterion

Acceptance Criterion

- Applicants must hold a secondary school certificate (scientific branch or equivalent).
- Meet the minimum GPA/score set annually by the Ministry of Higher Education.
- Fulfill any additional requirements (e.g., interview or placement test if applicable).

13. The most important sources of information about the program

- University and college official websites.
- Student guidebook and annual catalog.
- Academic advising and orientation sessions.
- Official announcements and notices issued by the department.

14. Program Development Plan

- Periodic curriculum review every 3–5 years to align with scientific and industrial advances.
- Continuous update of laboratories, equipment, and digital resources.
- Faculty development through training, workshops, and research collaboration.
- Strengthening partnerships with industry for training and employment opportunities.
- Integration of sustainability, innovation, and modern technologies in teaching and

research.

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
Level one/semester one	UOB101	English Language I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE101	Mathematics I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE102	Analytical Chemistry	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE103	Engineering Drawing & Process flow sheeting)	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE104	Chemical Engineering Principles I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	UOB102	Democracy and human rights	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE105	Engineering Mechanics & Workshop Technology	Basic	X	X	X	X	X	X	X	X	X	X	X	X
Level one/semester two	CHE106	Mathematics II	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE107	Physics	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE108	Organic Chemistry	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	UOB103	Computer I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE109	Chemical Engineering Principles II	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE110	Strength of Materials	Basic	X	X	X	X	X	X	X	X	X	X	X	X

	UOB104	Arabic Language I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
Level two/semester one	CHE201	Applied Mathematics I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE202	Fluid Mechanics I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE203	Electrical Technologies	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE204	Material and energy Balances I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	UOB203	Computer II	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	UOB201	English Language II	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	UOB205	The crimes of the Baath regime in Iraq	Basic	X	X	X	X	X	X	X	X	X	X	X	X
Level two/semester two	CHE205	Applied Mathematics II	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE206	Fluid Mechanics II	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE207	Physical Chemistry	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE208	Fuels and Sustainable Energy	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE209	Materials and Energy Balance II	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE210	Environmental Pollution & Water Technologies	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	UOB204	Arabic Language II	Basic	X	X	X	X	X	X	X	X	X	X	X	X
Level three/semester one	CHE311	Chemical Eng. Analysis I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE312	Heat Transfer I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE313	Mass Transfer I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE314	Chemical Eng. Thermodynamics I	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE315	Engineering Materials Properties	Basic	X	X	X	X	X	X	X	X	X	X	X	X
	CHE316	Petrochemical Engineering	Basic	X	X	X	X	X	X	X	X	X	X	X	X

Level three/semester two	CHE321	Chemical Eng. Analysis II	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	CHE322	Heat Transfer II	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	CHE323	Mass Transfer II	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	CHE324	Corrosion Engineering	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	CHE325	Chemical Eng. Thermodynamics 2	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	CHE326	Chemical Industries	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
Level four/semester one	Engineering Project I	Engineering Project I	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	Unit Operation	Unit Operation	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	Process Dynamics	Process Dynamics	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	Equipment Design I	Equipment Design I	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	Reactor design I	Reactor design I	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	Petroleum Refinery I	Petroleum Refinery I	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	Numerical Methods	Numerical Methods	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	Projects Management & Ethics	Projects Management & Ethics														
Level four/semester two	E411	Engineering Project I	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	CHE412	Unit Operation	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	CHE413	Process Dynamics	Basic	X	X	X	X	X	X	X	X	X	X	X	X	
	CHE414	Equipment Design I	Basic	X	X	X	X	X	X	X	X	X	X	X	X	

	CHE415	Reactor design I	Basic	x	x	x	x	x	x	x	x	x	x	x	x
	CHE416	Petroleum Refinery I													
	CHE417	Numerical Methods	Basic	x	x	x	x	x	x	x	x	x	x	x	x

- **Please tick the boxes corresponding to the individual program learning outcomes under evaluation.**

Course Description Form

1. Course Name:
2. Course Code:
3. Semester / Year:
4. Description Preparation Date:
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total)
7. Course administrator's name (mention all, if more than one name)
Name: Email:
8. Email: Course Objectives

Course Objectives	•

9. Teaching and Learning Strategies

Strategy	

10. Course Structure

Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**

11. Course Evaluation
12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	

Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Heat transfer 1
2. Course Code:
CHE312
3. Semester / Year:
First / Third
4. Description Preparation Date:
2025/9/9
5. Available Attendance Forms:
Attendance in classroom
6. Number of Credit Hours (Total) / Number of Units (Total)
60 hr /
7. Course administrator's name (mention all, if more than one name)
Name: Ahmed S Sadeq Email: ahmed.sadeq@uobasrah.edu.iq
8. Course Objectives

Course Objectives	**This subject presents an elementary treatmen the principles of heat transfer. Presentation of subject follows classical lines of sepa discussions for conduction, convection, radiation. Conduction is treated from both analytical and the numerical viewpoint, so that student is afforded the insight that is gained fr analytical solutions as well as the important to of numerical analysis that must often be used practice. A similar procedure is followed in presentation of convection heat transfer. integral analysis of both free- and force convection boundary layers is used to preser physical picture of the convection process. Fr this physical description, inferences may drawn that naturally lead to the presentation empirical and practical relations for calculat convection heat transfer coefficients. Becaus provides an easier instruction vehicle than ot methods, the radiation-network method is us extensively in the introduction of analysis radiation**

9. Teaching and Learning Strategies

Strategy	White Board Data show Laboratory

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**4**	**Modes of heat**	Heat transfer by conduction ,convection ,radiation	**Lecture**	**Quiz**
2	**4**	**conduction**	Fourier's Law. Radial systems (cylinder and sphere)	**Lecture**	**Quiz**
3	**4**	**conduction**	Thermal conductivity, Compound resistance in series.	**Lecture**	**Quiz**
4	**4**	**conduction**	Concept of thermal diffusivity;, Critical thickness of insulation	**Lecture**	**Quiz**
5	**4**	**conduction**	Unsteady state heat conduction with and without heat generation.	**Lecture**	**Quiz**
6	**4**	**conduction**	numerical analysis for the steady state conduction two dimensions	**Lecture**	**Quiz**
7	**4**	**fins**	Steady state heat transfer analysis through extended surface	**Lecture**	**Quiz**
8	**4**	**fins**	Fin performance ,Fin efficiency	**Lecture**	**Quiz**
9	**4**	**Unsteady state**	Unsteady state lumped heat capacity system	**Lecture**	**Quiz**
10	**4**	**Unsteady state**	One dimensional unsteady state heat conduction- semi infinite	**Lecture**	**Quiz**
11	**4**	**Unsteady state**	Use of transient – temperature charts	**Lecture**	**Quiz**
12	**4**	**Unsteady state**	Use of transient – temperature charts	**Lecture**	**Quiz**
13	**4**	**convection**	Heat transfer by convection	**Lecture**	**Quiz**
14	**4**	**convection**	Convection heat transfer mechanism; Forced convection in systems of simple geometrics (plate, cylinder).	**Lecture**	**Quiz**
15	**4**	**convection**	Thermal boundary layer; Co-relation for heat transfer coefficient: internal flow & external flow	**Lecture**	**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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1- Hollman J.P., Heat Transfer, McGraw Hill 2 اسس انتقال الحرارة انكروبيرا
Main references (sources)	1. Kern D.Q., Process Heat Transfer, McGraw Hill
Recommended books and references(scientific journals, reports…)	Websites
Electronic References, Websites	

Course Description Form

1. Course Name:
Mass Transfer I
2. Course Code:
303
3. Semester / Year:
Third year / first semester
4. Description Preparation Date:
10/9/2025
5. Available Attendance Forms:
10/9/2025
6. Number of Credit Hours (Total) / Number of Units (Total)
60
7. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Rusul Naseer Mohammed Email: rusul.mohamed@uobasrah.edu.iq
8. Course Objectives: The objective of studying mass transfer is to identify the most important methods of mass transfer in chemical process. Also, learn about the different separation method which occurs in many chemical; and industrial processes, such as absorption, evaporation, drying, precipitation, and distillation. Mass transfer is used by different scientific disciplines for different processes and mechanisms. It is used in chemical engineering for processes that involve diffusive and convective transport of different systems. This study is aimed to learn the chemical engineering student the chemical the principle of diffusion process. it learns the chemical design steps for different separation including, absorption, extraction, leaching, drying, all types of distillation and evaporation. etc. it also aims to drive all equation design that can find the diameter, stage number and all design process requirement.
9. Teaching and Learning Strategies
1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories. 5- Graduation projects. 6- Scientific visits. 7- Seminars held in the department. 8- Summer training.

Assessment methods
1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Diffusion process	Introduction and the theory of diffusion	Theoretical	questions and discussion
2	4	Types of Diffusion process	Gas diffusion ;	Theoretical	questions and discussion
3	4	Types of Diffusion process	Liquid diffusion ;	Theoretical	questions and discussion
4	4	Mass transfer coefficient	Solid diffusion	Theoretical	questions and discussion
5	4	Absorber tower design for dilute solution and concentrated	Problem- solving and examples	Theoretical	questions and discussion
6	4	Absorber tower design for	Determination the mass transfer coefficient	Theoretical	questions and discussion
7	4	Extraction process	Design of packed and trey column	Theoretical	questions and discussion
8	4	Extraction process	Extraction design+ Problem	Theoretical	questions and discussion
9	4	leaching process	Extraction design+ Problem- solving and examples	Theoretical	questions and discussion

10	4	and Leaching design	Leaching design+ Problem- solving and examples	Theoretical	questions and discussion
11	4	Leaching design	Leaching design+ Problem- solving and examples	Theoretical	questions and discussion
12	4	Leaching design+ Problem- solving and examples	Leaching design	Theoretical	questions and discussion
13	4	Drying design	drying	Theoretical	questions and discussion
14	4	Drying design	drying	Theoretical	questions and discussion
15	4	Humidification design	Humidification	Theoretical	questions and discussion

11. Course Evaluation

- Interaction within the lecture
- Homework and reports
- Quizzes
- Midterm and final exams

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	C.J.Geankoplis, Transport Processes and Unit Operations, Prentice-Hall . T.K.Sherwood, R.L.Pigford and C.R.Wilke, Mass Transfer, McGraw-Hill R.E.Treybal, Mass-Transfer Operations, McGraw-Hil
Main references (sources) Recommended books and references (scientific journals, reports...)	1. Coulson J.M. & Richardson J.F., Chemical ,Engineering, Volume 1 .2 2. Coulson J.M. & Richardson J.F., Chemical Engineering, Volume 3·Binery K.Dutta, principle of mass transfer and separation
Electronic References, Websites	https://eng.uobasrah.edu.iq/

Course Description Form

1. Course Name:
Heat transfer 2
2. Course Code:
CHE322
3. Semester / Year:
Second / third
4. Description Preparation Date:
2025/9/9
5. Available Attendance Forms:
Attendance in classroom
6. Number of Credit Hours (Total) / Number of Units (Total)
56 hr / 3 unit
7. Course administrator's name (mention all, if more than one name)
Name: Ahmed S Sadeq Email: ahmed.sadeq@uobasrah.edu.iq
8. Course Objectives

Course Objectives	**The objective of studying heat transfer is identify the most important methods of h transfer. Also, learn about the diffusion equat in heat transfer and derive its mathemat model. This course aims to learn how to calcu the rate of heat transfer by conduction throu solid bodies for different shapes and coordinat Also, in this course the student will study transfer of heat by convection to identify this t of heat transfer methods and its most import types and the mathematical equations for e type and how to calculate the heat transfer r for the internal and external flow. The course a aims to calculate the rate of heat transfer forced convection and in the different types heat exchanger and the most mathemat equations used in these types**

9. Teaching and Learning Strategies	
Strategy	Board Data show

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	**Convection**	Convection heat transfer mechanism; Forced convection in systems of simple geometrics (plate, cylinder).	**Lecture**	**Quiz**
2	4	**Convection**	Thermal boundary layer; Co-relation for heat transfer coefficient: internal flow & external flow	**Lecture**	**Quiz**
3	4	**Condensation and boiling**	Heat transfer of fluids with phase change: Introduction; Dropwise and film-type ondensation; Film condensation on vertical surface, Nusselt equation;	**Lecture**	**Quiz**
4	4	**Convection**	Condensation outside horizontal and vertical tube bank; Heat transfer to boiling liquid, Analysis of boiling curve, Nucleate boiling mechanism	**Lecture**	**Quiz**
5	4	**Convection**	Experimental relations of heat transfer by forced convection inside pipes	**Lecture**	**Quiz**
6	4	**Convection**	Flow through cylindrical and spherical bodies, Flow through bundle of tubes	**Lecture**	**Quiz**
7	4	**radiation**	Radiation heat transfer: Introduction; Black body radiation, Plank's distribution law, Monochromatic emissive power; Wein's displacement law	**Lecture**	**Quiz**
8	4	**radiation**	Kirchoff's Law; Emissivity of Solids, Concept of gray body; Radiation between surfaces	**Lecture**	**Quiz**
9	4	**radiation**	Concept of View Factor, Radiation shield; Absorption and emission in a gaseous medium.	**Lecture**	**Quiz**
10	4	**Heat exchanger**	Heat Exchanger: Classification; Construction of shell and tube heat exchanger	**Lecture**	**Quiz**
11	4	**Heat exchanger**	LMTD and NTU method	**Lecture**	**Quiz**
12	4	**Heat exchanger**	correction factor, Dirt factor, Individual and overall heat transfer coefficient	**Lecture**	**Quiz**
13	4	**evaporation**	Design procedure of shell and tube heat exchanger.	**Lecture**	**Quiz**
14	4	**evaporation**	Evaporation: Classification; Capacity, Steam economy; Boiling point elevation (Duhring rule)	**Lecture**	**Quiz**
15	4	**evaporation**	Material and energy balance of single effect evaporator; Design procedure of single effect evaporator;	**Lecture**	**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	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	1- Hollman J.P., Heat Transfer, McGraw Hill 2-اسس انتقال الحرارة انكروبيرا
Main references (sources)	1- Kern D.Q., Process Heat Transfer, McGraw Hill
Recommended books and references (scientific journals, reports…)	Websites
Electronic References, Websites	

Course Description Form

1. Course Name:
Mass Transfer II
2. Course Code:
309
3. Semester / Year:
Third year / Second semester
4. Description Preparation Date:
10/9/2025
5. Available Attendance Forms:
10/9/2025
6. Number of Credit Hours (Total) / Number of Units (Total)
60
7. Course administrator's name (mention all, if more than one name)
Name: Prof. Dr. Rusul Naseer Mohammed Email: rusul.mohamed@uobasrah.edu.iq
8. Course Objectives: The study of mass transfer aims to identify the most important methods in chemical processes. It also aims to identify the various separation methods used in many chemical and industrial processes, such as distillation, cooling towers, humidification, and evaporation. Various scientific disciplines use mass transfer in various processes and mechanisms. In chemical engineering, it is used in processes involving diffusion and convection transport of various systems. This study aims to teach chemical engineering students the steps of chemical design for various separation processes, including absorption, extraction, filtration, drying, all types of distillation and evaporation, etc. It also aims to design all equations that can find the diameter, number of stages, and all process design requirements. This study aims to study and analyze the most important separation, heat, and mass transfer processes, specifically distillation, cooling tower operation, and evaporation systems. The goal is to: Understand the basic principles governing phase equilibrium and heat and mass transfer in these processes; Evaluate the design and operating criteria that affect efficiency, energy consumption, and product quality.
9. Teaching and Learning Strategies
1- Explanation and clarification through lectures. 2- Display scientific materials with projectors: data show, smart boards, plasma screens. 3- Self-learning through homework and mini-projects within the lectures. 4- Laboratories. 5- Graduation projects.

6- Scientific visits.
7- Seminars held in the department.
8- Summer training.

Assessment methods
1- Short exams (Quiz).
2- Homework.
3- Semester and final exams for theoretical and practical subjects.
4- Small projects within the lesson.
5- Interaction within the lecture.
6- Reports.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	4	Distillation process	**Distillation process, batch distillation without reflux and with reflux**	Theoretical	questions and discussion
2	4	Distillation process	Binary distillation. key components, minimum number of plates, minimum reflux ratio , binary flash distillation design.	Theoretical	questions and discussion
3	4	Distillation process	McCade-Thiclc method, Lewis-Sorel method to design the rectifying distillation column	Theoretical	questions and discussion
4	4	Distillation process	Rectifying distillation column types, side stream, two feed column	Theoretical	questions and discussion
5	4	Multicomponent distillation:	Multicomponent distillation: bubble and dew point calculations for multicomponent systems; simplified methods for calculation of stages	Theoretical	questions and discussion
6	4	distillation: tower design	Multi component flash distillation, continuous rectification, key	Theoretical	questions and discussion

			components, minimum number of plates minimum reflux ratio for multicomponent		
7	4	distillation: efficiency	Tray Efficiency, Murphree Efficiency for vaporer and liquid	Theoretical	questions and discussion
8	4	binary distillation tower design	Analysis of binary distillation by Ponchon-Savarit	Theoretical	questions and discussion
9	4	Extractive distillation	Method , Azeotropic and Extractive distillation.	Theoretical	questions and discussion
10	4	Humidification process	Calculation the height of the cooling tower, Merkel and Mickley method, Carey and Williamson method	Theoretical	questions and discussion
11	4	cooling tower	heat of cooling calculation, cooling tower design , Tutorials	Theoretical	questions and discussion
12	4	cooling tower	Evaporation, types of evaporators, material and energy balances in the evaporators.,	Theoretical	questions and discussion
13	4	Evaporation process	Evaporation, types of evaporators, material and energy balances in the evaporators.,	Theoretical	questions and discussion
14	4	Evaporation	Steam consumption calculation in evaporator	Theoretical	questions and discussion
15	4	multi-effect evaporator Evaporation	Application of multi-effect evaporator in water treatment, process design .Tutorial	Theoretical	questions and discussion

11. Course Evaluation

- Interaction within the lecture
- Homework and reports
- Quizzes
- Midterm and final exams

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	1. .J.Geankoplis, Transport Processes and Unit Operations, Prentice-Hall . 2. T.K.Sherwood, R.L.Pigford and C.R.Wilke, Mass Transfer, McGraw-Hill 3. R.E.Treybal, Mass-Transfer Operations, McGraw-Hil
Main references (sources)	1. Coulson J.M. & Richardson J.F., ,Chemical Engineering, Volume 1 2. Coulson J.M. & Richardson J.F., Chemical Engineering, Volume 3. `Binery K.Dutta, principle of mass transfer and separation
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	https://eng.uobasrah.edu.iq/

Course Description Form

1. Course Name:	
petrochemical industries	
2. Course Code:	
3. Semester / Year:	
Second Semester/ third year	
4. Description Preparation Date:	
10/09/2025	
5. Available Attendance Forms:	
Attendance in classroom	
6. Number of Credit Hours (Total) / Number of Units (Total)	
32 hours theoretical	
7. Course administrator's name (mention all, if more than one name)	
Name: Ruwaida Mohammed Husseian Email: ruwaida.mohammed@uobasrah.edu.iq	
8. Email: Course Objectives	
Course Objectives	1. Understanding the Fundamentals of the Petrochemical Industry: Providing students with a comprehensive understanding of the industrial processes that produce petrochemicals from oil and natural gas. 2. Linking Chemical Engineering to Industry: Explaining how engineering and chemical principles are applied to the design and operation of petrochemical plants. 3. Identifying Raw Materials and Products: Studying feedstocks (such as ethane, propane, naphtha) and end products (such as ethylene, polyethylene, polypropylene, etc.). 4. Analyzing Technological Processes: Understanding basic processes such as steam cracking, catalytic cracking, separation, and purification used in industry.

	5. Evaluating Economic and Technical Feasibility: Learning the principles for selecting appropriate industrial processes based on economic and environmental feasibility. 6. Promoting Environmental Awareness and Safety: Understanding the impact of the petrochemical industry on the environment and understanding ways to reduce emissions and achieve industrial safety. 7. Job Market Preparation: Preparing students for work in oil refineries, petrochemical plants, and energy companies through an understanding of the industrial and technological structure. 8. Keeping abreast of the latest developments in the field: Learning about modern technologies and global trends in the petrochemical industry. 9. Developing analytical and problem-solving skills: Enabling students to analyze industrial problems and select appropriate technical solutions. 10. Stimulating research and development: Encouraging students to innovate and conduct research in the fields of petrochemical process development and improvement.
9. Teaching and Learning Strategies	
Strategy	• Theoretical Presentation Using a Data Show (Projector) Based on the "How and Why We Learn" Methodology: The theoretical content is delivered through the use of an electronic projector (Data Show) in an interactive manner that supports deep understanding of concepts. This approach is based on the "How and Why We Learn" methodology, where learners are encouraged to explore the underlying mechanisms behind the information (how), and to understand the motivations and educational objectives (why). This type of presentation enhances visual interaction and allows the information to be conveyed in an organized and clear way, which

	contributes to increasing learners' motivation and developing their critical and analytical thinking skills. • Theoretical Presentation Using the Blackboard (Handwriting) Based on the "How and Why We Learn" Methodology: This approach relies on presenting the theoretical material through illustrative writing on the blackboard, giving learners an opportunity for immediate interaction with the content. This presentation is integrated with the "How and Why We Learn" methodology, aiming to stimulate learners to think about the learning mechanisms and reasons, and to deepen understanding rather than rote memorization. This method is suitable for explaining concepts step-by-step and allows adapting the explanation based on students' responses, which enhances active participation and strengthens their logical and analytical thinking skills.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Understand how basic petrochemicals like olefins and aromatics are produced. Learn the conversion of methane into useful chemicals. Know the main derivatives of ethylene, propylene, and butylene and their industrial importance.	Production of the basic materials for the petrochemical industry (olefins and aromatics	Lecture	Quiz
2	2		Petrochemicals from methane	Lecture	Quiz
3	2		Ethylene derivatives	Lecture	Quiz
4	2		Propylene derivatives	Lecture	Quiz
5	2		Petrochemicals from butylene	Lecture	Quiz
6	2	explains the derivation of petrochemicals from high molecular weight olefins and aromatic compounds like benzene, xylenes, phenol, styrene, and toluene, along with their industrial applications in producing	High molecular weight olefins derivatives	Lecture	Quiz
7	2		Petrochemicals from benzene and zylenes	Lecture	Quiz
8	2		Petrochemicals from phenol	Lecture	Quiz
9	2		Petrochemicals from styrene and toluene	Lecture	Quiz
10	2		Petrochemicals from benzene and zylenes	Lecture	Quiz

		polymers and valuable chemical products.			
11	2	To learn how polymers are made, how thermoplastics can be reshaped by heating, while thermosets harden permanently. You'll also understand the production of strong industrial fibers and durable industrial rubber used in many products.	Polymers production techniques	Lecture	Quiz
12	2		Thermoplastic	Lecture	Quiz
13	2		Thermosit	Lecture	Quiz
14	2		Industrial fibers	Lecture	Quiz
15	2		Industrial rubber	Lecture	Quiz

11. Course Evaluation	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	• Dryden C . E, chemical technology ,east-west press principles of polymerization , Odian.
Main references (sources)	• Polymer Chemistry and Technology Author: Dr. Korkis Abdul Adam • Introduction to Petrochemicals by Dr. Imad Abdul Qader Al-Dabouni
Recommended books and references (scientific journals, reports...)	Reputable Websites Library Websites of Some International Universities
Electronic References, Websites	

Course Description Form

1. Course Name: Equipment design
2. Course Code: **(CHE 408)**
3. Semester / Year: Semester
4. Description Preparation Date:10/9/2025
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total) 45
7. Course administrator's name (mention all, if more than one name)
Name:Hayfaa L.Swadi Email: hyfaa.swadi@uobasrah.edu.iq
8. Course Objectives

Course Objectives	..... activities undertaken by an engineer. It is the synthesis, the putting together, of ideas to ..... achieve a desired purpose. The design does not exist at the commencement of the project. The designer starts with a specific objective in mind, a need, and by developing and evaluating possible designs, arrives at what he considers the best way of achieving that objective; be it a better chair, a new bridge, or for the chemical engineer, a new chemical product or a stage in the design of a production process. When considering possible ways of achieving the objective the designer will be constrained by many factors, which will narrow down the number of possible designs; but, there will rarely be just one possible solution to the problem, just one design. Several alternative ways of meeting the objective will normally be possible, even several best designs, depending on the nature of the constraints

9. Teaching and Learning Strategies	
Strategy	1. Explanation and clarification through lectures 2. How to display scientific materials using display devices: data shows, smart boards, plasma screens. 3. Self-learning through homework and mini-projects within lectures 4. Laboratories 5. Graduation projects 6. Scientific visits 7. Seminars held in the department 8. Summer training

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

10.Course structure

Week	Subject	(hr/ w)	Required learning outcomes	Teaching method	Exam(hr/ w) Evaluation method
1	Pumps, Pump selection, Pressure drop in pipelines, Power requirements for pumping liquids.	3	Pumps	a lecture	Exam
2	Characteristic curves for centrifugal pumps, System curve (operating line) Net positive suction Head (NPSH), Pump and other shaft seals.	3		a lecture	Exam
3	Continuous distillation: process description, Reflux considerations, Feed-point location Selection of column pressure.	3	Continuous distillation	a lecture	Exam
4	Selection of column pressure, Continuous distillation: basic principles, Stage equations Dew points and bubble points.	3		a lecture	Exam
5	Equilibrium flash calculations	3		a lecture	Exam
6	Multicomponent distillation: short-cut methods for stage and reflux requirements.	3		a lecture	Exam

7	Types of packing, Packed-bed height, Prediction of the height of a transfer unit (HTU) and Column diameter	3		a lecture	Exam
8	Heat-exchanger standards and codes Tubes, Shells Tube-sheet layout (tube count), Shell types (passes)Baffles, Support plates and tie rods, Tube sheets (plates) Shell and header nozzles (branches),Flow-induced tube vibrations Mean temperature difference (temperature driving force),Shell and tube exchangers: general design considerations	3	Heat-exchanger	a lecture	Exam
9	Two phase gas oil separations, Introduction, Factor affecting separation, Description of Equipment.	3		a lecture	Exam
10	Two phase gas oil separations, Introduction, Horizontal Separator, Vertical Separator, and Spherical Separator.	3	Two phase gas oil separations	a lecture	Exam
11	Two phase gas oil separations, separations Sizing, Horizontal Separator, Vertical Separator, Procedure for Sizing Horizontal & Vertical Separators.	3		a lecture	Exam
12	Fired Heaters, Type and classification, the principle objectives, the components of a furnace, Furnaces Performance, Fired Heaters and their applications in high temperature industries, Physical processing, Chemical processing, Issues in Furnace design, Discussion to Solve Examples about Furnace.	3	Fired Heaters	a lecture	Exam
13	Equipment Design Tanks, &Drums, Vessel Mechanical Design Requirements for Sizing and Specification, Basic Mechanical Details, Liquid Storage tanks.	3	Equipment Design Tanks, &Drums	a lecture	Exam
14	General Design considerations of Pressure Vessels, The Design of Thin Walled Vessels Under Internal Pressure, Vessels Supports. Discussion to Solve Examples about Mechanical Design	3	Equipment Design Tanks, &Drums	a lecture	Exam
15	Process Structure, Introduction, The Anatomy of Chemical Manufacturing Process, Process Flow Sheeting, Materials of Construction, Corrosion Resistance.	3	Process Structure	a lecture	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	
Required textbooks (curricular books, if any)	
Main references (sources)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

REFERENCES
CHEMICAL ENGINEERINGVOLUME 6 R. K. SINNOTT
CHEMICAL ENGINEERING BY PERRY

https://www.google.com/search?client=safari&hl=en-iq&q=Pressure+Vessel+Design+Manual+calculation&sa=X&ved=2ahUKEwjbke7z7_TwAhXtgf0HHfoqD7cQ1QIwHHoECBQQAQ&biw=375&bih=628&dpr=3

Course Description Form

1. Course Name:
Numerical method
2. Course Code:
CHE417
3. Semester / Year:
First / Fourth
4. Description Preparation Date:
2025/9/9
5. Available Attendance Forms:
Attendance in classroom
6. Number of Credit Hours (Total) / Number of Units (Total)
56 hr /3 unit
7. Course administrator's name (mention all, if more than one name)
Name: Ahmed S Sadeq Email: ahmed.sadeq@uobasrah.edu.iq
8. Course Objectives

Course Objectives	**A- Knowledge and Understanding** **1- Clarify the main concepts in the course.** **2- Gain a basic understanding for apply numerical methods in practical issues.** **B. Subject-specific skills** **1- The ability to think and solve particular probl or issue.** **2 - The ability to gain experience in apply numerical methods.**

9. Teaching and Learning Strategies	
Strategy	White Board Data show Laboratory

10. Course Structure

Week	Hours Lec+lab	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	**2+2**	Solution of Nonlinear equations	Bisection method, Newton-Raphson method, Secant method,	**Lecture+lab**	**Quiz**
2	**2+2**	Solution of Nonlinear equations	Modified Newton-Raphson method for multiple roots, Finding of multiple roots of a polynomial, Solution of a set of non-linear equations	**Lecture+lab**	**Quiz**
3	**2+2**	Solution of Nonlinear equations	Application in thermodynamic property calculation, bubble point and dew point calculation.	**Lecture+lab**	**Quiz**

4	**2+2**	Solution of simultaneous linear equations	Gauss elimination Method, Gauss-Jordon Method	**Lecture+lab**	**Quiz**
5	**2+2**	Solution of simultaneous linear equations	Iterative method - Jacobi iteration, Gauss-Seidel Method. SOR method,	**Lecture+lab**	**Quiz**
6	**2+2**	Solution of simultaneous linear equations	Application in chemical engineering example	**Lecture+lab**	**Quiz**
7	**2+2**	Numerical Solution of ODE	Euler's Method, Euler's 2nd and fourth order methods	**Lecture+lab**	**Quiz**
8	**2+2**	Numerical Solution of ODE	Implicit Euler	**Lecture+lab**	**Quiz**
9	**2+2**	Numerical differentiation and integration	Taylo's series Runge-Kutta Method (2^{nd})	**Lecture+lab**	**Quiz**
10	**2+2**	Numerical differentiation and integration	Runge-Kutta Method (3^{rd}, 4^{th})	**Lecture+lab**	**Quiz**
11	**2+2**	Numerical differentiation and integration	Heun' method	**Lecture+lab**	**Quiz**
12	**2+2**	Numerical differentiation and integration	Finite Difference method	**Lecture+lab**	**Quiz**
13	**2+2**	Numerical differentiation and integration	interpolation	**Lecture+lab**	**Quiz**
14	**2+2**	Interpolation	Lagrange method, Newton Divided interpolation	**Lecture+lab**	**Quiz**
15	**2+2**	Discussion and revision	Discussion and revision	**Lecture+lab**	**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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	Numerical Methods and Modeling for Chemical Engineer Davis M. E.
Recommended books and references(scientific journals, reports…)	Websites
Electronic References, Websites	

Course Description Form

1. Course Name:
Petroleum Refinery
2. Course Code:
CHE416/1st Semester
3. Semester / Year:
Semester
4. Description Preparation Date:
10-9-2025
5. Available Attendance Forms:
10-9-2025
6. Number of Credit Hours (Total) / Number of Units (Total)
7. Course administrator's name (mention all, if more than one name)
Name:SHAIMA ALBAZZAZ Email: shaima.shueayb@uobasrah.edu.iq
8. Email: Course Objectives

Course Objectives	1. Provide students with fundamental knowledge of crude oil composition and refining processes. 2. Explain the principles, operations, and industrial applications of major refining units (distillation, cracking, reforming, hydrotreating, desulfurization). 3. Train students in laboratory methods for analyzing and characterizing petroleum products (e.g., density, viscosity, flash point, octane/cetane number). 4. Develop students' ability to connect theoretical knowledge with practical applications in petroleum refining. 5. Introduce students to environmental and safety challenges in refineries and methods for their mitigation. 6. Prepare students for careers in the petroleum and petrochemical

	industries by strengthening their technical and analytical skills. 7. Encourage independent research and critical thinking on issues related to energy efficiency, cleaner fuels, and sustainable refining practices.

9. Teaching and Learning Strategies

Strategy	• **Teaching Methods**
	  ○ Interactive lectures supported with multimedia presentations and real industrial case studies.
	  ○ Laboratory sessions to provide hands-on experience in petroleum product testing and small-scale refining processes.
	  ○ Problem-based learning and group discussions to strengthen critical thinking and teamwork.
	  ○ Field visits to refineries and industrial plants to expose students to real-world operations.
	  ○ Guest lectures from industry experts to link academic content with current industrial practices.
	  ○ Use of e-learning platforms for sharing resources, assignments, and continuous communication.
	• **Learning Approach**
	  ○ Student-centered learning that combines theoretical knowledge with practical application.
	  ○ Integration of modern simulation tools and software to model refining processes.
	  ○ Continuous feedback through quizzes, reports, and presentations to track progress.
	  ○ Emphasis on safety, environmental responsibility, and professional ethics throughout the course.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Understand the composition and classification of crude oil	Introduction to Petroleum & Crude Oil Properties	Lecture + Discussion	Written Quiz

2	3	Explain the principles of atmospheric distillation	Atmospheric Distillation	Lecture + Case Study	Written Test
3	3	Describe the operation and importance of vacuum distillation	Vacuum Distillation	Lecture + Diagram Analysis	Short Report
4	3	Explain thermal cracking and its applications	Thermal Cracking	Lecture + Video Demonstration	Written Quiz
5	3	Understand catalytic cracking and its industrial role	Catalytic Cracking (FCC)	Lecture + Problem Solving	Assignment
6	3	Identify the role of reforming in improving fuel quality	Catalytic Reforming	Lecture + Case Study	Written Test
7	3	Explain hydroprocessing and hydrocracking	Hydrotreating & Hydrocracking	Lecture + Lab Demo	Lab Report

11. Course Evaluation

Component	Description	Weight (%)
Midterm Exam	Assessment of theoretical concepts from the first half of the course	20%
Final Exam	Comprehensive theoretical assessment covering the entire course	40%
Quizzes & Assignments	Short quizzes, problem-solving tasks, and written assignments	10%

Laboratory Work	Hands-on experiments and practical application of petroleum product testing	15%
Lab Reports & Practical Exam	Written reports and practical skill assessment in the lab	10%
Class Participation & Presentations	Active participation in discussions, group projects, and oral presentations	5%

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	✓
Main references (sources)	✓
Recommended books and references (scientific journals, reports...)	✓
Electronic References, Websites	✓

Course Description Form

1. Course Name:
Unit operations
2. Course Code:
CHE412
3. Semester / Year:
First semester/fourth year
4. Description Preparation Date:
9/9/2025
5. attendance mode :
Attendance in the classroom
6. Number of Credit Hours (Total) / Number of Units (Total)
3 theory+2 practicle+1 discussion/4 units
7. Course administrator's name (mention all, if more than one name)
Name:Prof. Dr. Alaa Abdulrazaq Email:alaa.jassim@uobasrah.edu.iq
8. **Course Objectives**
Understanding the fundamentals of industrial processes: Enable students to comprehend the operation of essential industrial units such as reactors, heat exchangers, absorption columns, and distillation towers. Analyzing and structuring industrial processes: Teach students how to analyze process flows within an industrial unit and identify the function of each component in achieving production goals. Linking theoretical concepts to practical applications: Integrate theoretical knowledge—such as heat transfer, mass transfer, and chemical reactions—with the actual operation of industrial equipment. Designing industrial units based on engineering principles: Train students to apply engineering design methods for selecting equipment dimensions and estimating performance under various operating conditions. Developing problem-solving skills for industrial challenges: Prepare students to identify and address operational issues in industrial units using systematic engineering analysis. Understanding industrial standards and safety: Familiarize students with established industrial design and operational standards, with a strong focus on safety, reliability, and sustainability. Preparing for industry engagement: Equip students with the knowledge required to participate effectively in chemical industries through a solid understanding of production lines and industrial unit operations.

9. Teaching and Learning Strategies	
Strategy	using a whiteboard, with a focus on the 'how and why' of each topic, in accordance with the course syllabus. using data show presentations, emphasizing the 'how and why' approach, aligned with the course content and learning outcomes. Laboratory-based instruction utilizing specialized equipment to measure various material properties under experimental conditions.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3+1+2	Procedure for designing industrial filters	Filtration processes, general introduction, design variables, types of filters	Lecture + tutorial+ laboratory	Quiz or report writing
2	3+1+2		Filter press, method of operation, design equations	Lecture + tutorial+	Quiz or report writing
3	3+1+2		Filter drum, optimum time of filtration, rate of washing, design equation	laboratory	Quiz or report writing
4	3+1+2	Procedure for designing sedimentation tanks	Sedimentation processes, types of filters, mechanism of sedimentation processes	Lecture + tutorial+	Quiz or report writing
5	3+1+2		Design of sedimentation tanks, chemical additives	laboratory	Quiz or report writing
6	3+1+2	Procedure for designing packed columns	Fluid flow through granular beds	Lecture + tutorial+	Quiz or report writing
7	3+1+2		Fluid flow through packed columns	laboratory	Quiz or report writing
8	3+1+2		Flooding and loading point	Lecture + tutorial+	Quiz or report writing
9	3+1+2		Design of packed columns	laboratory	Quiz or report writing
10	3+1+2	Procedure for calculation the energy consumption of crushers	Size reduction processes	Lecture + tutorial+	Quiz or report writing
11	3+1+2		Types of miles, screen analysis	laboratory	Quiz or report writing

12	3+1+2	Calculating the fluidization velocity	Fluidization processes	Lecture + tutorial+	Quiz or report writing
13	3+1+2	Calculating the bulk velocity	Particle mechanism	laboratory	Quiz or report writing
14	3+1+2		Shear stresses and drag force	Lecture + tutorial+	Quiz or report writing
15	3+1+2	Procedure for designing centrifugal devices	Centrifuge processes, types of centrifuge, design equations	laboratory	Quiz or report writing

11. Course Evaluation	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	Coulson & Richardson, Chemical Engineering, Vol. 1 & 2
Recommended books and references (scientific journals, reports...)	Smith, Unit Operations of Chemical Engineering
Electronic References, Websites	Scientific journals Online academic databases University library websites

Course Description Form

1. Course Name: Equipment design
2. Course Code: **(CHE 408)**
3. Semester / Year: 2nd Semester
4. Description Preparation Date:10/9/2025
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total) 30
7. Course administrator's name (mention all, if more than one name)
Name:Hayfaa L.Swadi Email: hyfaa.swadi@uobasrah.edu.iq
8. Course Objectives

Course Objectives	..... activities undertaken by an engineer. It is the synthesis, the putting together, of ideas to achieve a desired purpose. The design does not exist at the commencement of the project. The designer starts with a specific objective in mind, a need, and by developing and evaluating possible designs, arrives at what he considers the best way of achieving that objective; be it a better chair, a new bridge, or for the chemical engineer, a new chemical product or a stage in the design of a production process. When considering possible ways of achieving the objective the designer will be constrained by many factors, which will narrow down the number of possible designs; but, there will rarely be just one possible solution to the problem, just one design. Several alternative ways of meeting the objective will normally be possible, even several best designs, depending on the nature of the constraints

9. Teaching and Learning Strategies	
Strategy	1. Explanation and clarification through lectures 2. How to display scientific materials using display devices: data shows, smart boards, plasma screens. 3. Self-learning through homework and mini-projects within lectures 4. Laboratories 5. Graduation projects 6. Scientific visits 7. Seminars held in the department 8. Summer training

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method

10.Course structure

Week	Subject	(hr/ w)	Required learning outcomes	Teaching method	Exam(hr/ w) Evaluation method
1	Introduction, The Anatomy of Chemical Manufacturing Process, Process Flow Sheeting, Materials of Construction, Corrosion Resistance. .	2	equipment design	a lecture	Exam
2		2		a lecture	Exam
3	GAS LIQUID SEPARATORS Settling velocity Vertical separators &Horizontal separators	2	equipment design	a lecture	Exam
4		2		a lecture	Exam
5		2		a lecture	Exam
6	. CRUSHING AND GRINDING (COMMINUTION) EQUIPMENT	2		a lecture	Exam
7	CYCLONE SEPARATOR	2	equipment design	a lecture	Exam
8	MATERIAL OF CONSTRACTION	2	equipment design	a lecture	Exam
9		2		a lecture	Exam
10		2	equipment design	a lecture	Exam
11		2		a lecture	Exam

12	Furnace. , Type and classification, the principle objectives, the components of a furnace, Furnaces Performance, Fired Heaters and their applications in high temperature industries, Physical processing, Chemical processing, Issues in Furnace design, Discussion to Solve Examples about Furnace.	2	equipment design	a lecture	Exam
13	Fluidization	2	equipment design	a lecture	Exam
14	Discussion equipment design	2	equipment design	a lecture	Exam
15	Discussion equipment design	2	equipment design	a lecture	Exam

11. Course Evaluation	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Vairam S, Kalyani P andSubaRamesh.,"Engineering Chemistry"., Wiley India PvtLtd.,NewDelhi., 2011 .
Main references (sources)	DaraS.S,UmareS.S."Engineering Chemistry", S. Chand & Company Ltd., New Delhi , 2010
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

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)	
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	

REFERENCES
CHEMICAL ENGINEERINGVOLUME 6 R. K. SINNOTT
CHEMICAL ENGINEERING BY PERRY

https://www.google.com/search?client=safari&hl=en-iq&q=Pressure+Vessel+Design+Manual+calculation&sa=X&ved=2ahUKEwjbke7z7_TwAhXtgf0HHfoqD7cQ1QIwHHoECBQQAQ&biw=375&bih=628&dpr=3

Course Description Form

1. Course Name:
Optimization and Simulation
2. Course Code:
CHE428
3. Semester / Year:
Second / Fourth
4. Description Preparation Date:
2025/9/9
5. Available Attendance Forms:
Attendance in classroom
6. Number of Credit Hours (Total) / Number of Units (Total)
56 hr /3 unit
7. Course administrator's name (mention all, if more than one name)
Name: Ahmed S Sadeq Email: ahmed.sadeq@uobasrah.edu.iq
8. Course Objectives

Course Objectives	**A- Knowledge and Understanding** **1- Clarify the main concepts in the course.** **2- Gain a basic understanding for applying optimization methods in practical issues.** **B. Subject-specific skills** **1- The ability to think and solve particular problem or issue.** **2- The ability to gain experience in apply optimization methods.**

9. Teaching and Learning Strategies	
Strategy	White Board Data show Laboratory

10. Course Structure

Week	Hours Lec+lab	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2+2	Introduction	Nature and organization of optimization problems	Lecture+lab	Quiz
2	2+2	Introduction	formulation of optimization problems	Lecture+lab	Quiz
3	2+2	Introduction	optimum in single and multi-variable unconstrained and constrained problem	Lecture+lab	Quiz
4	2+2	Optimization Techniques	Graphical Method - Simplex method - duality - dual simplex method	Lecture+lab	Quiz
5	2+2	Optimization Techniques	Lagrange multipliers and Kuhn-Tucker conditions - quadratic programming problem	Lecture+lab	Quiz
6	2+2	Numerical methods for unconstrained functions	one dimensional search - gradient-free search with fixed step size - gradient search with acceleration	Lecture+lab	Quiz
7	2+2	Numerical methods for unconstrained functions	Newton's method - Quasi-Newton method	Lecture+lab	Quiz
8	2+2	Numerical methods for unconstrained functions	fibonacci search - golden-section method	Lecture+lab	Quiz
9	2+2	Numerical methods for unconstrained functions	univariate search - simplex method - Powell's method - method of steepest descent - Fletcher-Reeves conjugate	Lecture+lab	Quiz
10	2+2	Classification of mathematical models	Fundamental features of models. General methods of solution	Lecture+lab	Quiz
11	2+2	Application to problems in staged operations	fluid mechanics, heat transfer and reactor design.	Lecture+lab	Quiz
12	2+2	Dynamic Simulations	Batch reactor, Gravity flow tank, Three CSTR in series, Non-isothermal CSTR	Lecture+lab	Quiz
13	2+2	Dynamic Simulations	Modeling and simulation of isothermal and non-isothermal operation of batch reactor	Lecture+lab	Quiz
14	2+2	Discussion and revision	Discussion and revision	Lecture+lab	Quiz
15	2+2	Discussion and revision	Discussion and revision	Lecture+lab	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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	
Main references (sources)	"Process Modeling Simulation and Control for Chemical Engineers" by Luyben W. L. "Optimization of Chemical Processes" by Luyben W. L.
Recommended books and references(scientific journals, reports…)	Websites
Electronic References, Websites	

Course Description Form

1. Course Name:
Petroleum Refinery Ⅱ
2. Course Code:
CHE427/2nd Semester
3. Semester / Year:
Semester
4. Description Preparation Date:
10-9-2025
5. Available Attendance Forms:
10-9-2025
6. Number of Credit Hours (Total) / Number of Units (Total)
3 theory+2 practicle+1 discussion/4 units
7. Course administrator's name (mention all, if more than one name)
Name:SHAIMA ALBAZZAZ Email: shaima.shueayb@uobasrah.edu.iq
8. Email: Course Objectives

Course Objectives	1. Introduce students to the origin, formation, and composition of petroleum and methods of crude oil evaluation. 2. 3. Provide knowledge about refinery products, their characteristics, analysis techniques, and industrial applications. 4. 5. Explain thermal processes such as cracking, coking, and steam cracking used in petroleum refineries. 6. 7. Develop understanding of catalytic processes including catalytic cracking, hydrocracking, desulfurization, reforming, isomerization, polymerization, and steam reforming.

	8. Familiarize students with conventional chemical treatment methods for petroleum products (acid treatment, clay treatment). 9. Provide insights into lubricating oils: properties, production techniques, solvent de-asphalting, furfural extraction, and de-waxing methods. 10. Enable students to understand the production of fuels and oil products such as gasoline, kerosene, jet fuel, diesel, asphalt, and wax. 11. Train students in practical laboratory tests for petroleum products, including density, flash point, viscosity, aniline point, sulfur content, water content, carbon residue, and salt content. 12. Strengthen the ability to link theoretical knowledge with practical applications in petroleum refining.
9. Teaching and Learning Strategies	

Strategy	• **Teaching Methods**
	  ○ Interactive lectures supported with multimedia presentations and real industrial case studies.
	  ○ Laboratory sessions to provide hands-on experience in petroleum product testing and small-scale refining processes.
	  ○ Problem-based learning and group discussions to strengthen critical thinking and teamwork.
	  ○ Field visits to refineries and industrial plants to expose students to real-world operations.
	  ○ Guest lectures from industry experts to link academic content with current industrial practices.
	  ○ Use of e-learning platforms for sharing resources, assignments, and continuous communication.
	• **Learning Approach**
	  ○ Student-centered learning that combines theoretical knowledge with practical application.
	  ○ Integration of modern simulation tools and software to model refining processes.

	○ Continuous feedback through quizzes, reports, and presentations to track progress. ○ Emphasis on safety, environmental responsibility, and professional ethics throughout the course.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Understand the origin, formation, and composition of petroleum; evaluate crude oils	Understand the origin, formation, and composition of petroleum; evaluate crude oils	Lecture + Discussion	Written Quiz
2	3	Identify refinery products and their industrial uses	Identify refinery products and their industrial uses	Lecture + Case Study	Written Test
3	3	Apply analytical methods for petroleum products	Apply analytical methods for petroleum products	Lecture + Diagram Analysis	Short Report
4	3	Explain fractionation principles of petroleum	Explain fractionation principles of petroleum	Lecture + Video Demonstration	Written Quiz
5	3	Describe thermal refining processes	Describe thermal refining processes	Lecture + Problem Solving	Assignment
6	3	Analyze catalytic refining processes	Analyze catalytic refining processes	Lecture + Case Study	Written Test

7	3	Explain advanced catalytic processes	Explain advanced catalytic processes	Lecture + Lab Demo	Lab Report

11. Course Evaluation

Component	**Description**	**Weight (%)**
Midterm Exam	Assessment of theoretical concepts from the first half of the course	20%
Final Exam	Comprehensive theoretical assessment covering the entire course	40%
Quizzes & Assignments	Short quizzes, problem-solving tasks, and written assignments	10%
Laboratory Work	Hands-on experiments and practical application of petroleum product testing	15%
Lab Reports & Practical Exam	Written reports and practical skill assessment in the lab	10%
Class Participation & Presentations	Active participation in discussions, group projects, and oral presentations	5%

12. Learning and Teaching Resources

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

Course Description Form

1. Course Name:
Transport phenomena
2. Course Code:
CHE423
3. Semester / Year:
2nd semester/fourth year
4. Description Preparation Date:
9/9/2025
5. attendance mode :
Attendance in the classroom
6. Number of Credit Hours (Total) / Number of Units (Total)
3 theory+1 discussion/4 units
7. Course administrator's name (mention all, if more than one name)
Name:Prof. Dr. Alaa Abdulrazaq Email:alaa.jassim@uobasrah.edu.iq
8. **Course Objectives**
1. Understanding the fundamentals of the three transport phenomena: Enable students to grasp the physical and mathematical principles of momentum transfer (fluid flow), heat transfer, and mass transfer. 2. Establishing connections between different transport phenomena: Train students to recognize the similarities among governing equations and models such as the Navier–Stokes equation, Fourier's law of heat conduction, and Fick's law of diffusion. 3. Developing the mathematical foundation for engineering system analysis: Use calculus and partial differential equations to analyze the behavior of engineering systems. 4. Analyzing and interpreting complex industrial processes: Equip students with the ability to analyze fluid flow, heat transfer, and mass diffusion within various industrial equipment. 5. Applying concepts to the design of industrial equipment: Utilize transport phenomena concepts in designing piping systems, heat exchangers, and calculating cooling rates and pressure losses. 6. Building a strong foundation for advanced engineering subjects: Prepare students for more advanced topics such as separation processes, reactor design, thermodynamics, and modeling. 7. Enhancing analytical and engineering thinking skills: Strengthen the student's ability to connect theoretical concepts to practical applications and solve real-world engineering problems.

9. Teaching and Learning Strategies	
Strategy	using a whiteboard, with a focus on the 'how and why' of each topic, in accordance with the course syllabus. using data show presentations, emphasizing the 'how and why' approach, aligned with the course content and learning outcomes. Laboratory-based instruction utilizing specialized equipment to measure various material properties under experimental conditions.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3+1	Procedure for designing industrial filters	Filtration processes, general introduction, design variables, types of filters	Lecture + tutorial	Quiz or report writing
2	3+1		Filter press, method of operation, design equations	Lecture + tutorial	Quiz or report writing
3	3+1		Filter drum, optimum time of filtration, rate of washing, design equation	Lecture + tutorial	Quiz or report writing
4	3+1	Procedure for designing sedimentation tanks	Sedimentation processes, types of filters, mechanism of sedimentation processes	Lecture + tutorial	Quiz or report writing
5	3+1		Design of sedimentation tanks, chemical additives	Lecture + tutorial	Quiz or report writing
6	3+1	Procedure for designing packed columns	Fluid flow through granular beds	Lecture + tutorial	Quiz or report writing
7	3+1		Fluid flow through packed columns	Lecture + tutorial	Quiz or report writing
8	3+1		Flooding and loading point	Lecture + tutorial	Quiz or report writing
9	3+1		Design of packed columns	Lecture + tutorial	Quiz or report writing
10	3+1	Procedure for calculation the energy consumption of crushers	Size reduction processes	Lecture + tutorial	Quiz or report writing
11	3+1		Types of miles, screen analysis	Lecture + tutorial	Quiz or report writing

12	3+1	Calculating the fluidization velocity	Fluidization processes	Lecture + tutorial	Quiz or report writing
13	3+1	Calculating the bulk velocity	Particle mechanism	Lecture + tutorial	Quiz or report writing
14	3+1		Shear stresses and drag force	Lecture + tutorial	Quiz or report writing
15	3+1	Procedure for designing centrifugal devices	Centrifuge processes, types of centrifuge, design equations	Lecture + tutorial	Quiz or report writing

11. Course Evaluation	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	
Main references (sources)	Coulson & Richardson, Chemical Engineering, Vol. 1 & 2
Recommended books and references (scientific journals, reports...)	Gean Koples, transport phenomena and unit operations
Electronic References, Websites	Scientific journals Online academic databases University library websites