Ministry of Higher Education and Scientific Research
Scientific Supervision and Scientific Evaluation
Quality Assurance and Performance Evaluation Division

Academic Programand Course Description Chemical Engineering Department

2024

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 Diyala

Faculty/Institute: College of Engineering

Scientific Department: Chemical Engineering Department

Academic or Professional Program Name: Bachelor

Final Certificate Name: Bachelor of Science in Chemical Engineering

Academic System: Course

Description Preparation: 2024

Completion Date: 20/7/2024

Signature:

Head of Department Name:

Lec. Dr. Muwafaq Mahdi Abd

Date: 23/7/2024

Signature:

Scientific Associate Name:

Jabar Qasim Jabar

Date:

The file is checked by: Assist Prof Salah N. Farhan

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date: 2024

Signature:

Approval of the Dean

Prof. Dr. Anees Abdullah Khadom

Academic Program Description Form

1. Program Vision

The vision of the Chemical Engineering Department is to be recognized as one of the distinguished departments in its education, research and outreach programs.

• Hopping to be a world-renowned department, advancing the contributions of chemical engineering through innovation, research, education, and social responsibility.

• Making every effort to provide the student with the foundations of modern knowledge and scientific research methods in the fields of chemical engineering.

• Working to develop the students' personality to make them capable of innovation, leadership, self-learning, and teamwork.

• Developing curricula periodically and according to local and international standards.

• Opening horizons of cooperation between the Department of Chemical Engineering and the departments of faculties of the University of Diyala and the corresponding departments in Iraqi universities.

2. Program Mission

• Preparing engineers with competence and scientific knowledge in the of chemical engineering and its technological developments.

• Enabling the graduate student to possess the skills in designing production units, oil, petrochemical, food and pharmaceutical industries.

• Preparing engineers capable for operate and manage factories related to chemical engineering specializations by focusing on the theoretical aspects and linking them to the practical aspect.

• Preparing the graduates to continue postgraduate studies in various fields of chemical engineering.

• Study the market needs for new and necessary branches of chemical engineering and implement it.

•Make contact with the community's needs for chemical engineering specializations by preparing highly qualified graduates.

• Working to develop teaching and learning methods and adopting modern methods in addition to traditional one.

• Contributing to providing academic and scientific consultations and developing services in Diyala Governorate in particular and Iraq in general.

3. Program Objectives

- Graduating effective scientific cadres who are distinguished scientifically and practically and are characterized by sound professional ethics and honesty.
- Promoting scientific research and encouraging creativity and innovators in the fields and applications of chemical technology.
- Providing an environment for stimulating the scientific thoughts.
- acquiring the local and international academic accreditation.

4. Program Accreditation

The department submitted an application to obtain program accreditation from the Iraqi Council for Engineering Accreditation

5. Other external influences

All relevant ministries in dealing with this program, such as the Ministry of Oil, Industry, Environment, and others

6. Program Structure

Program Structure	Number of Courses	Credit Hours	Percentage	Reviews
Institution Requirements	**0**	**0**	**0%**	
College Requirements	**4**	**10**	**9.1%**	
Department Requirements	**44**	**110**	**90.1%**	
Summer Training	**1 month**	**Without credit**	**-**	**Compulsory training**
Others				

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

7. Program Description

Year	Course code	Course Name	Credit Hours	
			Theoretical	**Practical**
First Year	E 101	Mathematics I	4	0
First Year	CHE 101	Organic Chemistry	2	2
First Year	CHE 102	Principles of Chemical Engineering	4	0
First Year	CHE 103	Engineering Mechanics	3	0
First Year	U 101	Democracy and Human Rights	2	0
First Year	U 103	Computer skills	1	2
First Year	E 102	Mathematics II	4	0
First Year	CHE 104	Analytical Chemistry	2	2
First Year	CHE 105	Material Balance	4	0
First Year	CHE 106	Engineering Drawing	1	3
First Year	U 104	English Language	2	0
First Year	CHE 107	Workshop Engineering	0	3
First Year	UD02	Arabic Language	2	0
Second Year	E201	Engineering Mathematics I	4	
Second Year	Ch. E202	Fluid Flow I	4	
Second Year	Ch. E203	Physical Chemistry I	3	
Second Year	Ch. E204	Petroleum and Gas Technology	3	2
Second Year	Ch. E205	Visual Basic programming	2	2
Second Year	Ch. E206	Principles of Chemical Engineering III	3	
Second Year	Ch. E207	Environmental Pollution	2	
Second Year	Ch. E208	Statistic and probability	1	
Second Year	E202	Engineering Mathematics II	4	
Second Year	Ch. E210	Fluid Flow II	4	2
Second Year	Ch. E211	Green Chemical Technology	2	
Second Year	Ch. E212	Physical Chemistry II	3	2
Second Year	Ch. E213	Instrumentation and Chemical Analysis	2	
Second Year	Ch. E214	MATLAB for Engineers	2	2
Second Year	Ch. E215	Industrial Safety	2	
Third Year	Ch. E301	Applied Mathematics	3	
Third Year	Ch. E302	Mass transfer I	4	
Third Year	Ch. E303	Biochemical Engineering	2	

Third Year	Ch. E304	Food Engineering	2	
Third Year	Ch. E305	Heat transfer I	4	2
Third Year	Ch. E306	Thermodynamics I	3	
Third Year	Ch. E307	Materials Science and Technology	2	2
Third Year	Ch. E308	Industrial Managements	2	
Third Year	Ch. E309	Numerical and Optimization methods	3	
Third Year	Ch. E310	Mass transfer II	4	2
Third Year	Ch. E311	Economics of Chemical Engineering	2	
Third Year	Ch. E312	Combustion engineering	2	
Third Year	Ch. E313	Heat transfer II	4	
Third Year	Ch. E314	Thermodynamics II	3	
Third Year	Ch. E315	Chemical and petrochemical Industries	3	2
Third Year	Ch. E316	Polymer technology	2	
Fourth Year	E402	Graduation Project	1	2
Fourth Year	Ch. E402	Units Operation I	4	2
Fourth Year	Ch. E403	Processes Control I	3	
Fourth Year	Ch. E404	Reactor Design I	3	
Fourth Year	Ch. E405	Petroleum Refinery I	3	
Fourth Year	Ch. E406	Equipment Design	3	
Fourth Year	Ch. E407	Corrosion Engineering	2	
Fourth Year	E402	Graduation Project	1	2
Fourth Year	Ch. E409	Units Operation II	4	
Fourth Year	Ch. E410	Processes Control II	3	2
Fourth Year	Ch. E411	Reactor Design II	4	
Fourth Year	Ch. E412	Petroleum Refinery II	3	
Fourth Year	Ch. E413	Natural gas processing	2	
Fourth Year	E401	Engineering Profession Ethics	1	

8. Extended learning outcomes of the program

A- Knowledge	
1- Knowledge and understanding	➢ Knowing the facts, concepts, principles and theories of chemical engineering, and understanding the determinants and constraints facing the engineer's work for the purpose of making the right decision. ➢ Understanding basic mathematical derivations and linking various phenomena with equations and laws to determine the variables that govern the industrial unit. ➢ The ability to know the optimal conditions for industrial work and manage it correctly.
2- Awareness and understanding	➢ Awareness of industrial problems that may be specific to known or unknown circumstances. ➢ Analyze and discuss available data or conduct specific experiments to obtain more data.
3- Ability to apply	➢ Design units and processes and make the necessary improvements. ➢ The ability to apply new technologies within the general jurisdiction. ➢ Having a comprehensive view of industrial engineering problems, taking into account cost, safety and quality
Skills	
1- The ability to use a variety of sources of understanding 2- Conduct successful laboratory experiments or design a safe experiment and extract important data 3- Work ethically and have the ability to identify and identify risks	➢ Using multiple techniques and devices related to the specialty. ➢ Using laboratory equipment to find data. ➢ Develop and provide a safe work environment by selecting the most appropriate devices and equipment.
Ethics	
1- Professional work, taking into account costs and occupational safety 2- Working in the spirit of one team and ensuring human victory 3- Anticipating problems and finding appropriate solutions to them	➢ Ethics and professionalism of the profession. ➢ The impact of industrial activities on society, both negatively and positively. ➢ Compatibility with environmental issues and environmental preservation

9. Teaching and Learning Strategies

1. Theoretical lectures with the use of illustrations.
2. Practical laboratory application of concepts taught theoretically
3. Assigning students to perform seminars by assigning them a topic to be discussed with their colleagues
4. Solve problems, discuss them, and assign students some homework and reports through the e-learning platform.

10. Evaluation methods

- Sudden exams (5) marks
- Monthly exams (25) marks
- Reports assigned to them (5) degrees
- Homework assignments (5) marks
- A final examination of the curriculum (60 marks).

11. Facility

Facility Members

Academic Rank	Specialization		Special Requirements / Skills		Number of Teaching	
	General	Special			Staf	lecture
Prof. Dr. Anees A. Khadom	Chemical Engineering	Corrosion			staff	
Prof. Dr. Ahmed Daham Wiheeb	Chemical Engineering	Mass transfer			staff	
Ass. Prof. Dr. Salah N. Farhan	Chemical Engineering	Biochemical Engineering			staff	
Ass. Prof. Dr. Adiba Alnuaimi	Chemical Engineering	Electrochemistry			staff	
Lec. Dr. Ali Z. Alhassan	Chemical Engineering	Unit operation			staff	
Lec. Dr. Muwafaq Mahdi Abd	Chemical Engineering	Fluid Flow			staff	
Lec. Dr. Muhammed Faiq	Chemical Engineering	Mass transfer			staff	
Lec. Dr. Mohammed H. Msaed	Chemical Engineering	Reactor Design			staff	
Assistant Lecturer Nabaa B. Ali	Science of Chemistry	Physical Chemistry			staff	
Ass. Prof. Mohammad A. Hameed	college of Literature	Hebrew language			staff	
Lec. Dr. Ahmed Abbas	Chemical Engineering	Corrosion			staff	
Assistant Lecturer Ali I. Abdalla	Electrical Engineering	Power Converters			staff	
Ass. Prof. Sura Fahmy Yousif	Communication engineering	Image processing			staff	
Assistant Lecturer Whalaa A. Alkhaisi	Petroleum Engineering	Drilling wells			staff	
Ass. Prof. Yaser I. Jasem	Civil Engineering	Environmental Engineering			staff	
Ass. Prof. Mustafa S Mahdi	Mechanical Engineering	Thermal engineering			staff	
Lec. Khalid Al Dolaimy	Mechanical Engineering	Mechanical Design			staff	
Lec. Mohammed k. Mohammed	Nuclear engineering	Environmental Engineering			staff	
Lec. Mohanad A. Sultan	Science of Chemistry	Organic Chemistry			staff	
Ilaf W. Ibrahim	General Law	Human Rights			staff	
Lec. Mutaz H. Ismael	Chemical engineering	Oil Refinery			staff	

Professional Development
Orienting new faculty members
New teaching staff are developed by putting them in central development courses organized by the university, as well as by interacting with senior staff during periodic meetings in the department for the purpose of introducing them to the work contexts and informing them of directives and instructions, along with giving advice, daily guidance and continuous follow-up.
Professional Development of faculty members
Professional development for faculty members takes place through the Divisions of Continuing Education and Academic Affairs in the Deanship of the College and its corresponding departments in the University, which constantly work to hold discussion circles and specialized scientific seminars, while reviewing what is published on the Internet sites of books and periodicals in various scientific specializations.

12- Acceptance criterion

Admission is centralized by the Ministry of Higher Education and Scientific Research according to the grade point average of the students obtained in the sixth scientific stage.

13- The most important sources of information about the program

- Diyala University website / College of Engineering / Department of Chemical Engineering

Website of the Ministry of Higher Education and Scientific Research

11- Program development plan

- Development is carried out by focusing on the advanced scientific staff in the department and through the committees formed annually, especially the Scientific Committee and the Quality Assurance and Academic Accreditation Committee.
- By preparing evaluation studies to prepare and develop senior leadership cadres in all aspects of the educational institution.
- Equipping scientific laboratories with modern equipment and qualifying their cadres in order to improve the most efficient performance.
- Develop future plans and work to implement them
- Creating a kind of competition among researchers, honoring the distinguished ones and motivating them to give more.
- Working to create a kind of financial income for the department to sustain and develop the work
- Supporting the department's first-in-class admission program annually and enrolling them in postgraduate studies.
- Conducting a twinning process with advanced universities and providing training opportunities for teaching staff in those universities

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Program Skills Outline

Year/ Level	CourseCode	CourseName	Basic or optional	program Learning outcomes											
				Required Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
Second Year / First Course	E201	Engineering Mathematics I	Basic		√			√				√			
	Ch. E202	Fluid Flow I	Basic	√			√			√			√		√
	Ch. E203	Physical Chemistry I	Basic			√			√		√				√
	Ch. E204	Petroleum and Gas Technology	Basic	√			√				√		√		
	Ch. E205	Visual Basic programming	Basic			√			√			√		√	√
	Ch. E206	Principles of Chemical Engineering III	Basic		√			√		√				√	
	Ch. E207	Environmental Pollution	Basic	√			√				√		√		
	Ch. E208	Statistic and probability	Basic			√			√			√		√	√
Second Year / Socond Course	E202	Engineering Mathematics II	Basic		√			√		√				√	
	Ch. E210	Fluid Flow II	Basic	√			√				√		√		
	Ch. E211	Green Chemical Technology	Basic			√			√			√		√	√
	Ch. E212	Physical Chemistry II	Basic		√			√		√				√	
	Ch. E213	Instrumentation and Chemical Analysis	Basic	√			√				√		√		
	Ch. E214	MATLAB for Engineers	Basic			√			√			√		√	√
	Ch. E215	Industrial Safety	Basic	√		√	√	√		√				√	√
Third Year / First Course	Ch. E301	Applied Mathematics	Basic		√			√				√		√	
	Ch. E302	Mass transfer I	Basic	√			√			√			√		√
	Ch. E303	Biochemical Engineering	Basic			√			√		√				√
	Ch. E304	Food Engineering	Basic	√			√				√		√		
	Ch. E305	Heat transfer I	Basic			√			√			√		√	√
	Ch. E306	Thermodynamics I	Basic		√			√		√				√	
	Ch. E307	Materials Science and Technology	Basic	√			√				√		√		
	Ch. E308	Industrial Managements	Basic			√			√			√		√	√
Third Year /	Ch. E309	Numerical and Optimization methods	Basic		√			√		√				√	
	Ch. E310	Mass transfer II	Basic	√			√				√		√		
	Ch. E311	Economics of Chemical Engineering	Basic			√			√			√		√	√

Second Course	Ch. E312	Combustion engineering	Basic		√			√		√				√	
	Ch. E313	Heat transfer II	Basic	√			√				√		√		
	Ch. E314	Thermodynamics II	Basic			√			√			√		√	√
	Ch. E315	Chemical and petrochemical Industries	Basic	√		√	√	√		√				√	√
	Ch. E316	Polymer technology	Basic		√			√				√		√	
Fourth Year / First Course	E402	Graduation Project	Basic	√			√			√			√		√
	Ch. E402	Units Operation I	Basic			√			√		√				√
	Ch. E403	Processes Control I	Basic	√			√				√		√		
	Ch. E404	Reactor Design I	Basic			√			√			√		√	√
	Ch. E405	Petroleum Refinery I	Basic		√			√		√				√	
	Ch. E406	Equipment Design	Basic	√			√				√		√		
	Ch. E407	Corrosion Engineering	Optional			√			√			√		√	√
	E402	Graduation Project	Basic		√			√		√				√	
Fourth Year / Second Course	Ch. E409	Units Operation II	Basic	√			√				√		√		
	Ch. E410	Processes Control II	Basic			√			√			√		√	√
	Ch. E411	Reactor Design II	Basic		√			√		√				√	
	Ch. E412	Petroleum Refinery II	Basic	√			√				√		√		
	Ch. E413	Natural gas processing	Optional			√			√			√		√	√
	E401	Engineering Profession Ethics	Basic	√		√	√	√		√				√	√

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

SECOND STAGE

Course Description Form

1. Course Name:
Physical Chemistry I
2. Course Code:
Ch.E.203
3. Semester / Year:
Course I 2024
4. Description Preparation Date:
3/5/2024
5. Available Attendance Forms: **Attendance**
6. Number of Credit Hours (Total) / Number of Units (Total)
3 hrs/ 2 units
7. Course administrator's name (mention all, if more than one name)
Name: Assist. Lect. Nabaa Burhan Ali **Email: nabaa_burhan_eng@uodiyala.edu.iq**
8. Course Objectives

Course Objectives	Identify the branches of physical chemistry and practical applications in physical chemistry The program has been arranged in a way that covers all areas of physical chemistry, where the kinetic theory of gases, the foundations of thermodynamics, thermal chemistry, chemical equilibrium, the movement of chemical reactions, and electrochemistry were identified.

9. Teaching and Learning Strategies	
Strategy	1. Lectures. 2. Introducing Power Point slides. 3. Data collection and reporting. 4. Discussions. 5. Daily and monthly exams.

10. Course Structure					
Week	Hrs	Required Learning Outcome	Unit or subject name	Learning method	Evaluation method
1	3	1. Definitions and general terms 2.Zero law of thermodynamics	Zero law of thermodynamics	Lectures and reports	Unannounced exams, announced exams and self-assessment during the lecture
2-3	6	1. General theory of gases 2.Miscellaneous examples 3.Definition of heat and work 4.The first law of thermodynamics	First law of thermodynamics	Lectures and reports	Unannounced exams, announced exams and self-assessment during the lecture
4	3	1. Definition of enthalpy 2.Change of state by constant volume 3.Change of state by constant pressure. 4.Calculation of the heat capacity of gases	First law of thermodynamics	Lectures and reports	Unannounced exams, announced exams and self-assessment during the lecture
5	3	1. Thermochemistry 2.Standard reaction temperature calculation. 3.Calculation of solution temperature 4.Set of solved problems	Thermochemistry	Lectures and reports	Unannounced exams, announced exams and self-assessment during the lecture
6-7	6	1. Automatic and non-automatic operations. 2. Carnot Course 3.The second law of thermodynamic.	Second Law of thermodynamics	Lectures and reports	Unannounced exams, announced exams and self-assessment during the lecture
8	3	Exam			
9-10	6	1.Entropy 2.Entropy dependence on pressure 3.Entropy dependence on temperature 4.Third law of thermodynamics 5.Set of solved problems	Second Law of thermodynamics	Lectures and reports	Unannounced exams, announced exams and self-assessment during the lecture
11-12	6	1.Thermodynamic equations of closed system 2.Maxwell equations 3.Computation of compression energy 4.Effect of temperature and pressure on pressing energy 5.Set of solved examples	General Equations for Thermodynamics	Lectures and reports	Unannounced exams, announced exams and self-assessment during the lecture

13	3	1.General Chemical Equilibrium Modifier 2. Chemical Equilibrium of Ideal Gas 3. Relationship between the equilibrium constant in terms of pressures and the equilibrium constant in terms of concentrations	Chemical Equilibrium	Lectures and reports	Unannounced exams, announced exams and self-assessment during the lecture
14	3	1. Calculation of the degree of dissociation 2. Effect of temperature on chemical equilibrium constant 3. Effect of inert gas on chemical equilibrium. 4.Set of solved problems	Chemical Equilibrium	Lectures and reports	Unannounced exams, announced exams and self-assessment during the lecture
15	3	Exam			

11.Cours Evaluation
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily, oral, monthly and written exams, reports, seminars and.... etc
12. Learning and Teaching Resources
1.Robert A. Alberty “Physical Chemistry “seven edition
2.K.K. Sharma “ Physical Chemistry “
3.Arun Bahl , B.S.Bahl ,G.D.Tuli “Essentials of Physical Chemistry “S.Chand and Company ltd 2008

Course Description Form

1. Course Name:
Computer Programming II
2. Course Code:
Ch.E.205
3. Semester / Year:
First semester/second year
4. Description Preparation Date:
28-4-2024
5. Available Attendance Forms:
Attendance
6. Number of Credit Hours (Total) / Number of Units (Total):
30 Theoretical+30 Practical\ 3 units
7. Course administrator's name (mention all, if more than one name)
Name: Assist. Lect. Sura F. Yousif Email: sura.fahmy@uodiyala.edu.iq
8. Course Objectives

Course Objectives	The computer science subject aims to teach the student during the academic year a basic idea about the main computer languages and the systems that operate in them, in addition to designing, analyzing and writing mathematical problems, systems, equations, and chemical and engineering reactions using programming languages.
9. Teaching and Learning Strategies	
Strategy	1- The teacher delivers detailed theoretical lectures. 2- The teacher requests periodic reports on the basic topics of the subject. 3- Discussions.

10. Course Structure

Week	Hrs.	Required Learning Outcome	Unit or subject name	Learning method	Evaluation method
1	2	The teacher explains an introduction to the MATLAB program	A brief history importance of MATLAB	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
2	2	The teacher explains the MATLAB program using a simplified program	Simple program of MATLAB	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
3	2	The teacher explains the MATLAB program using a simplified program	Simple program of MATLAB	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
4	2	Teaching the student about the types of data, variables, arithmetic	Variable, numbers, operations, functions	Lectures presented in PowerPoint	Daily exams + practical experiments + monthly

		functions, and subprograms		format	exams
5	2	Teaching the student to write and solve differential equations	Teaching students to write and solving differential equations	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
6	2	Teaching the student to write and solve equations. 1- Derivative. 2- Integration.	Teaching students on writing and solving equations. 1. derivative. 2. integration.	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
7	2	Teaching the student how to draw functions	plots in MATLAB	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
8	2	Teaching the student how to draw functions using applied examples	plots of points, axes label, graph title	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
9	2	Teaching the student how to graph multiple functions	drawing multi point in the same graph	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
10	2	Teaching the student about unary matrices in the MATLAB program	Arrays, 1-D arrays initialization	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
11	2	Teaching students about creating multi-dimensional arrays in MATLAB	2D- arrays, matrix operations in matlab	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
12	2	Teaching the student about control functions in MATLAB	Basic program control (for) statement	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
13	2	Teaching the student about conditional functions in the MATLAB program	nesting loop, (if) statement	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
14	2	Teaching the student about conditional functions in the MATLAB program	(if …..else) statement	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
15	2	Examples of conditional functions	Example about if condition	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams

11.Cours 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 book , if any):

- Chemical Engineering Computation with MATLAB®, 1st Edition, and Professor Yeong Koo Yeo teaches chemical engineering at the College of Engineering of Hanyang University, Seoul, South Korea.
- Essential MATLAB for Engineers and Scientists, Fourth Edition, Brian H. Hahn, Daniel T. Valentine
- Essential MATLAB for Engineers and Scientists, Fifth Edition, Brian H. Hahn, Daniel T. Valentine

Main references (source):

- College library to obtain additional sources for the curriculum.
- Check scientific websites to see recent developments in the subject.

Recommended book and references (scientific journals, reports …….): All solid scientific journals that are related to the broad concept of programming.

Electronic References, Website:

1. http://www.cprogramming.com/ 2- http://www.mathworks.com/

Course Description Form

1. Course Name:
Physical Chemistry II
2. Course Code:
Ch.E.212
3. Semester / Year:
Course II 2024
4. Description Preparation Date:
3/5/2024
5. Available Attendance Forms: **Attendance**
6. Number of Credit Hours (Total) / Number of Units (Total)
45 Theoretical+30 Practical\ 2 units
7. Course administrator's name (mention all, if more than one name)
Name: Assist. Lect. Nabaa Burhan Ali **Email:nabaa_burhan_eng@uodiyala.edu.iq**
8. Course Objectives

Course Objectives	On the branches of physical chemistry and practical applications in physical chemistry, the program has been arranged in a way that covers all areas of physical chemistry, where phase equilibrium, phase rule, Raoult's and Henry's laws, and Y were identified, as well as electrochemistry, photochemistry and their interactions were studied.

9. Teaching and Learning Strategies

Strategy	1. Lectures. 2. Introducing Power Point slides. 3. Data collection and reporting. 4. Discussions. 5. Daily and monthly exams. 6. Practical experiences.

10- Course structure					
Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1-2	6	1.Phase rule 2.Single-component systems 3.Clapeyron equation – calculation of the change in melting point by pressure change	Phase equilibrium	Lectures and Reports	Unannounced exams, announced exams, self-assessment during the lecture, practical experiences
3	3	1.Clausius-Clapeyron equation – calculation of the change in boiling point by changing the pressure 2.Two-component systems	Phase equilibrium	Lectures and Reports	Unannounced exams, announced exams, self-assessment during the lecture, practical experiences
4-6	9	1.Raoult's Law 2.Phase Equilibrium of Non-Ideal Solutions 3.Henry's Law 4.AssociativeProperties A. Osmotic pressure B. Boiling point rise C. Freezing point decrease 5. Set of solved problems	Phase equilibrium	Lectures and Reports	Unannounced exams, announced exams, self-assessment during the lecture, practical experiences
7	3	Exam			
8-9	6	1.General equation of electrochemical cells. 2. Nernest equation Calculation of the acidity function of the solution through the emf force 3.Calculation of the standard electrode voltage from the dependence of the electromotive force of the cell on the electrolyte concentration 4.Concentration cell. 5. Solved set	Electrochemical	Lectures and Reports	Unannounced exams, announced exams, self-assessment during the lecture, practical experiences
10-12	9	1. Kinetics of chemical reactions 2. Finding the order of reaction 3. Finding the order of reaction from the time of half life. 4. First order interactions 5. Second order interactions. 6. Third order interactions 7. Zero-rank interactions. 8. Sequential reactions. 9. Chain reactions 10. Finding the activation energy of the reaction from the dependence	Chemical Kinetics	Lectures and Reports	Unannounced exams, announced exams, self-assessment during the lecture, practical experiences

		of the reaction constant on temperature. 11.Set of solved issues			
13-14	6	Photochemistry and its laws and problem solving and differentiations	Photoche mistry	Lectures and Reports	Unannounced exams, announced exams, self-assessment during the lecture, practical experiences
15	3	Exam			

11.Cours Evaluation
Distributing the grade out of 100 according to the tasks assigned to the student such as daily preparation, daily, oral, monthly and written exams, reports, seminars and practical experiences.... etc.

12. Learning and Teaching Resources
1.Robert A. Alberty "Physical Chemistry " seven edition
2.K.K. Sharma " Physical Chemistry "
3.Arun Bahl , B.S.Bahl ,G.D.Tuli "Essentials of Physical Chemistry "S.Chand and Company ltd 2008

Course Description Form

1. Course Name: **Computer Programming III**
2. Course Code: **Ch.E.214**
3. Semester / Year: **Second semester\second year**
4. Description Preparation Date: **28-4-2024**
5. Available Attendance Forms: **Attendance**
6. Number of Credit Hours (Total) / Number of Units (Total)
30 Theoretical+30 Practical\3 units

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

Name: Assist. Lect. Sura F. Yousif
Email: sura.fahmy@uodiyala.edu.iq

8. Course Objectives

Course Objectives	The computer science subject aims to teach the student during the academic year a basic idea about the main computer languages and the systems that operate in them, in addition to designing, analyzing and writing mathematical problems, systems, equations, and chemical and engineering reactions using programming languages.

9. Teaching and Learning Strategies

Strategy	1- The teacher delivers detailed theoretical lectures. 2- The teacher requests periodic reports on the basic topics of the subject. 3- Discussions.

10. Course Structure

Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1	2	Introduction to Simulink in Matlab	Introduction to Simulink in Matlab	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
2	2	Simulink Library Browser and Block Libraries in Simulink	Introduction to Simulink in Matlab	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
3	2	Continuous dynamics blocks, Discrete blocks, Math blocks, Sources, Sinks, Lines, Labeling Blocks	Introduction to Simulink in Matlab	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
4	2	Create a New Model, Simulation, Design Various Modeling examples	Design Modeling Examples in Simulink	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
5	2	Saving Model, Closing Simulink. Applications on Chemical Engineering	Design Modeling Examples in Simulink	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
6	2	Solving Algebraic Equations	Solving Algebraic Equations in Simulink	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
7	2	Solving Differentiation, Solving Limited and Unlimited Integration	Solving Differentiation and Integration in Simulink	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
8	2	امتحان فصلي			
9	2	(AND, OR, Not, NOR, NAND, <, >, =, <=, >=)	Relational and Logical Operators in Simulink	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams

10	2	plot 1D, plot 2D and Subplots	Basic plotting in Simulink	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
11	2	Introduction to Matrix and Array generators	2D- arrays, matrix generators in Simulink	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
12	2	Addition, subtraction, multiplication, division, and exponentiation	Array arithmetic operations	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
13	2	Addition, subtraction, multiplication, and division	Matrix arithmetic operations	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
14	2	Various examples on array and matrix arithmetic operations	Array and matrix arithmetic operations	Lectures presented in PowerPoint format	Daily exams + practical experiments + monthly exams
15	2	امتحان فصلي			

11.Cours 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 book, if any):

- Chemical Engineering Computation with MATLAB®, 1st Edition, and Professor Yeong Koo Yeo teaches chemical engineering at the College of Engineering of Hanyang University, Seoul, South Korea.
- Essential MATLAB for Engineers and Scientists, Fourth Edition, Brian H. Hahn, Daniel T. Valentine
- Essential MATLAB for Engineers and Scientists, Fifth Edition, Brian H. Hahn, Daniel T. Valentine

Main references (source):

- College library to obtain additional sources for the curriculum.
- Check scientific websites to see recent developments in the subject.

Recommended book and references (scientific journals, reports …….): All solid scientific journals that are related to the broad concept of programming.

Electronic References, Website:

1. http://www.cprogramming.com/
2- http://www.mathworks.com/

Course Description Form

1. Course Name: **Engineering Statistic**
2. Course Code: **Ch.E.213**
3. Semester / Year: **Second semester /second stage**
4. Description Preparation Date: **28-4-2024**
5. Available Attendance Forms: **Attendance**
6. Number of Credit Hours (Total) / Number of Units (Total): **30 hours/1 unit**
7. Course administrator's name (mention all, if more than one name)
Name: Assist. Lect. Sura F. Yousif Email: sura.fahmy@uodiyala.edu.iq
8. Course Objectives

Course Objectives	Giving the student an overview of the principles and concepts of statistics and probability, and making the student able to represent data in the form of tables and graphics. Differentiate between quantitative and qualitative data and how they are represented. Knowing the types of descriptive measures such as arithmetic mean, frequency, range, amount of change and standard deviation. Knowledge of the principles of probability and its types and the laws of multiplication, addition and continuity in addition to the use of the laws of permutations and combinations in finding probability. Make the student able to know the types of distribution such as the normal distribution and use it to represent the types of probability.

9. Teaching and Learning Strategies	
Strategy	1- Lectures. 2- Presenting power point slides. 3- Collect data and prepare reports. 4- Discussions.

10. Course Structure

Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1	2	Introduction to statistics	Principles of Statistics	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
2-3	4	Types of quantitative and qualitative data and the way	Quantitative and qualitative data	Lectures, presentations, and	Unannounced exams and self-

		to represent them numerically and graphically		reports	assessment during the lecture
4-5	4	Descriptive measures such as mean, frequency, median value, amount of change, standard deviation, and range	descriptive metrics	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
6-7	4	Introduction to probability and its types and the laws of multiplication and addition using Venn forms	probability	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
8	2	semester exam			
9-10	4	Use permutations and combinations theorems to find probability values	Permutations and combinations	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
11-12	4	Introduction to the types of probability distribution such as normal distribution, Poisson distribution, Binomial distribution, Standard distribution	Types of probability distribution	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
13	2	central limit theorem	central limit theorem	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
14	2	curve fitting methods	curve fitting	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
15	2	semester exam			

11.Cours 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 book, if any): Douglus C. Montgomery, G. C. Runger, Applied Statistics and Probability for Engineers, John Wiley and Sons, 2003.

Main references (source): A. M. Mood and F. A. Graybill, an Introduction to the Theory of Statistics, Prentice Hall of India, 1963.

Recommended book and references (scientific journals, reports …….): P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Statistical Theory, Houghton Miffin, 1971.

Electronic References, Website:
http://www.pitt.edu/~super1/ResearchMethods/Arabic/statsticalbookinarabict.pdf.

Course Description Form

1. Course Name:
Industrial Safety
2. Course Code:
Ch.E215
3. Semester / Year:
Semester/ 2
4. Description Preparation Date:
30/4/2024
5. Available Attendance Forms:
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: Yaser I. Jasem Email: yaser_ij@uodiyala.edu.iq

8. Course Objectives	
Course Objectives	a) Ensuring the necessary protection for all production teams and reducing risk factors, especially with regard to the human factor. B) Reducing the incidence of occupational diseases such as poisoning and others. C) Reducing the possibility of injuries and accidents at work. d) Preventing and extinguishing fires and searching for preventive factors.

9. Teaching and Learning Strategies	
Strategies	•Teacher prepares lectures on the subject in electronic form and presents them to students. •The teacher gives lectures in detail. •The teacher requests periodic reports and homework on the main topics of the subject

10. Course Structure

Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1-2	4		- Chemical Hazards - Physical hazards - Biological Hazards - Safety hazards - Ergonomic hazards - Work organization hazard	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
3	2		Energy Hazardous include, forms of energy, ways to control energy risks, personal protective equipment, equipment to protect parts of the body, .including the eyes, face, head, etc	Lectures PDF power point Video in addition to the student's deductive questions	Classwork
4-5	4		Fire and Explosion: Introduction, cases of fire occurrence, the fire triangle, critical factors for the occurrence of fires, assessing the resulting risks and methods of controlling them, training workers, types of fires, in addition to the risks resulting from drilling wells.	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams +
6	2		The risks of pressure, heat, and radiation include: defining the risks of pressure and reviewing examples, defining the risks of heat and their effects, defining the risks of radiation and its types, and ways to deal with .these risks	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
7	2		Monthly exam	Lectures PDF power point Video in addition to the student's deductive questions	Monthly exam
8	2		Working at heights, resulting damages and accidents, requirements for working at heights, components of a personal fall prevention system, safe falls	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams

9	2		Maintenance work, its definition and types, damages associated with maintenance work, basic rules for safe maintenance	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams +
10-11	2		Well drilling operations, environmental challenges resulting from them, pollutants associated with drilling and production operations, problems of operating operations, management of solid waste resulting from drilling operations, risks of spilled oils, treatment processes, petrochemical industries and their effects	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
12	2		Management of drilling and cutting fluids for wells, drilling solution and methods of dealing with it, drilling fluids and methods of dealing with them, types of drilling fluids, environmental impacts of drilling waste, evaluation and management of drilling waste	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
13	2		Monthly exam	Lectures PDF power point Video in addition to the student's deductive questions	Monthly exam
14-15	4		Components of well drilling fluids, aqueous fluids, non-aqueous fluids, contaminants associated with them, effects of dealing with drilling fluids, potential exposure to risks, monitoring risks, assessing risks and ways to control them, training workers on how to deal with them	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams

11.Cours 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 book, if any)
Main references (source): **Introduction to Industrial and Systems Engineering (Prentice-Hall International Series in Industrial and Systems) 2nd Edition** by Wayne C. Turner (Author) **Prentice Hall International Series in Industrial & Systems Engineering: Systems Engineering and Analysis, Benjamin Blanchard**
Recommended book and references (scientific journals, reports …….):
Electronic References, Website: Any resources available on the Internet

Course Description Form

1. Course Name: Engineering mathematics I	
2. Course Code: E201	
3. Semester / Year:1st semester2024	
4. Description Preparation Date:5/6/2024	
5. Available Attendance Forms: compulsory	
6. Number of Credit Hours (Total) / Number of Units (Total) 60	
7. Course administrator's name (mention all, if more than one name)	
Name: Ali I. Abdalla Email: alialnuaimmy@uodiyala.edu.iq	
8. Course Objectives	
Course Objectives	1-Provide a Strong Foundation in Mathematical Concepts • Introduce fundamentals of calculus, linear algebra, and other core mathematical tools • Develop logical understanding and mathematical skills to solve engineering problems 2- Develop Problem-Solving Skills • Equip students with techniques to interpret objectives, mathematize, solve, and communicate results • Cultivate critical thinking and creativity in applying mathematics to engineering problems 3- Facilitate Active Learning • Use a mix of lectures, tutorials, discussions, and hands-on exercises for active learning • Provide guided practice with relevant engineering problems 4- Teach Applications to Engineering Fields • Relate mathematical concepts to real-world engineering scenarios and applications • Integrate engineering examples and case studies throughout the curriculum • Demonstrate the importance and symbiosis between mathematics and engineering The overall goal is to develop students' mathematical maturity and ability to apply advanced concepts to solve complex engineering problems. This requires a combination of solid foundational knowledge, practice with relevant applications, and explicit connections between theory and practice.

9. Teaching and Learning Strategies

Strategy	1- Integrate Lectures and Tutorials for Active Learning • Mix direct instruction in lectures with guided practice in tutorials for active learning • Include a variety of learning activities like problem-solving, discussions, and hands-on exercises 2- Use Relevant Examples and Applications • Use examples and problems with engineering contexts embedded throughout the course • Include some engineering guest lectures to explain real-world applications of the mathematical concepts • Relate the mathematics to specific engineering disciplines like fluid mechanics, structures, etc 3- Establish High Expectations and Develop Critical Thinking • Establish high expectations for students' mathematical understanding • Develop critical thinking and problem-solving skills • Cultivate creativity in applying mathematics to engineering problems The overall goal is to help students develop a strong conceptual understanding of the mathematics that is directly applicable to their engineering studies. This requires a combination of solid foundational knowledge, practice with relevant problems, and explicit connections to engineering applications. Both students and instructors play an active role in employing effective learning and teaching strategies to achieve this goal.

10. Course Structure

طريقة التقييم	طريقة التعليم	اسم الوحدة / أو الموضوع	مخرجات التعلم المطلوبة	الساعات	الأسبوع
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	Analytical geometry. Translation of axes equations.	الهندسة التحليلية	4	1
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	• **Conic sections** Circles – parabola	القطوع المخروطية الدائرة والقطع المكافيء	4	2

امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	ellipse – hyperbola	الدوال الزائدية والقطع الناقص	4	3
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	• **Partial differentiation** Functions of two or more variables, limit, continuity	الاشتقاق الجزئي والغاية والاستمرارية		4
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	Partial derivatives, Total differentials	الاشتقاق الجزئي والكلي	4	5
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	Geometrical meaning of partial derivatives	الدلالة الهندسية للمشتقة الجزئية	4	6
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	Higher order partial derivatives, implicit differentiation	الاشتقاق الجزئي والكلي وبمراتب متعددة	4	7
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	Relative minima and maxima of functions of two variables, linearization, small change problems	النهايات العظمى باستخدام الاشتقاق الجزئي		8
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	• **Polar coordinates system** Definition, polar equation, relating polar and Cartesian coordinates	الاحداثيات القطبية وعلاقتها مع الاحداثيات المتعامدة	4	9
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	Graph in polar coordinates,	الرسم البياني باستخدام نظام الاحداثيات القطبية	4	10
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	Area with polar coordinates	حساب المساحة باستخدام الاحداثيات القطبية	4	11
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة	Lectures and tutorials	• **Vectors** Definition,	المتجهات في الفراغ	4	12

exam,quizzes and class assessment	محاضرات وحل مسائل اثناء المحاضرة	properties, vectors in surface and in space			
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	Scalar and cross product of vectors, product of three vectors	ضرب المتجهات باختلاف انواعها ودلالتها	4	13
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam, quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	Equations of lines. Equations of planes	معادلات الخطوط المستقيمة والمستويات في الفراغ	4	14
امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam, quizzes and class assessment	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	Lagrange multipliers.	حسابات الحالة المثلى	4	15

11.Cours 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 book , if any)

1- George B. Thomas and Ross L. Finney, “Calculus and Analytic Geometry, Addison-Wesley, ISBN:0201531747.

2- Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley

Main references (source)

George F. Simmons, “Calculus with Analytic Geometry”, McGraw-Hill, ISBN: 0070576424

Electronic References , Website

https://www.geogebra.org/calculator

https://www.desmos.com/calculator

https://www.symbolab.com/solver/integral-calculator

Course Description Form

1. Course Name: Engineering Mathematics II
2. Course Code: E202

3. Semester / Year: Year:2nd semester2024
4. Description Preparation Date: 5/6/2024
5. Available Attendance Forms: compulsory
6. Number of Credit Hours (Total) / Number of Units (Total) 60
7. Course administrator's name (mention all, if more than one name)
Ali I. Abdalla Email: alialnuaimmy@uodiyala.edu.iq
8. Course Objectives

Course Objectives	1-Provide a Strong Foundation in Mathematical Concepts • Introduce fundamentals of calculus, linear algebra, and other core mathematical tools • Develop logical understanding and mathematical skills to solve engineering problems 2- Develop Problem-Solving Skills • Equip students with techniques to interpret objectives, mathematize, solve, and communicate results • Cultivate critical thinking and creativity in applying mathematics to engineering problems 3- Facilitate Active Learning • Use a mix of lectures, tutorials, discussions, and hands-on exercises for active learning • Provide guided practice with relevant engineering problems 4- Teach Applications to Engineering Fields • Relate mathematical concepts to real-world engineering scenarios and applications • Integrate engineering examples and case

	studies throughout the curriculum • Demonstrate the importance and symbiosis between mathematics and engineering The overall goal is to develop students' mathematical maturity and ability to apply advanced concepts to solve complex engineering problems. This requires a combination of solid foundational knowledge, practice with relevant applications, and explicit connections between theory and practice.
9. Teaching and Learning Strategies	
Strategy	1- Integrate Lectures and Tutorials for Active Learning • Mix direct instruction in lectures with guided practice in tutorials for active learning • Include a variety of learning activities like problem-solving, discussions, and hands-on exercises 2- Use Relevant Examples and Applications • Use examples and problems with engineering contexts embedded throughout the course • Include some engineering guest lectures to explain real-world applications of the mathematical concepts • Relate the mathematics to specific engineering disciplines like fluid mechanics, structures, etc 3- Establish High Expectations and Develop Critical Thinking • Establish high expectations for students' mathematical understanding • Develop critical thinking and problem-solving skills • Cultivate creativity in applying mathematics to engineering problems The overall goal is to help students develop a strong conceptual understanding of the mathematics that is directly applicable to their engineering studies. This requires a combination of solid foundational knowledge, practice with relevant problems, and explicit connections to engineering applications. Both students and instructors play an active role in employing effective learning and teaching strategies to achieve this goal.

10. Course Structure					
الأسبوع	الساعات	مخرجات التعلم المطلوبة	اسم الوحدة / أو الموضوع	طريقة التعليم	طريقة التقييم
1	4	التكاملات المتعددة	• **Multiple integrals** Double integral, changing double integral from Cartesian to polar form		امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
2	4	ايجاد المساحة باستخدام التكاملات المتعددة بنظامي الاحداثيات المتعامدة والقطبية	Area using double integral, area using polar coordinates	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
3	4	العزوم ومركز الثقل باستخدام التكاملات المتعددة	Moments and center of mass	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
4	4	حسابات الحجوم باستخدام التكاملات المتعددة	Triple integral, volume using triple integral	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
5	4	المتتابعات والمتتاليات	• **Sequence and series** Introduction, infinite series, geometric series	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
6	4	اختبارات المتتاليات	Tests of infinite series (Integral test, comparison test, ratio test, root test)	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
7	4	المتتاليات المتناوبة واختبارها	Alternating series, tests of alternating series	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
8	4	متتالية تايلور	Taylor series, McLaurin series	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
9	4	power seriesالمتتالية Tests for convergence	power series	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
10	4	المتتاليات Taylor	Taylor`s theorem with remainder	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment

11	4	المصفوفات وجبر المصفوفات	• **Matrix** introduction**,** types of matrix, matrix addition, subtraction and multiplication	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
12	4	المحددة وطريقة كرامر لحل المعادلات	Determinant, Grammar's rule	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
13	4	معكوس المصفوفة واستخدامها لحل المعادلات	Inverse of matrix, solution of system of linear equations by matrix	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
14	4	Rank of matrix	Rank of matrix	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment
15	4	Eigen value and Eigen vector	Eigen value and Eigen vector	Lectures and tutorials محاضرات وحل مسائل اثناء المحاضرة	امتحانات غير معلنة وتقييم ذاتي خلال المحاضرة exam,quizzes and class assessment

11.Cours 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 book , if any) 3- George B. Thomas and Ross L. Finney, "Calculus and Analytic Geometry, Addison-Wesley, ISBN:0201531747. **4-** Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley
Main references (source) ge F. Simmons, "Calculus with Analytic Geometry", McGraw-Hill, ISBN: 0070576424
https://www.geogebra.org/calculator https://www.desmos.com/calculator https://www.symbolab.com/solver/integral-calculator

Course Description Form

1. Course Name:
Environmental Pollution
2. Course Code:
Ch.E207
3. Semester / Year:
Semester/ 1
4. Description Preparation Date:
30/4/2024
5. Available Attendance Forms:
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:Yaser I. Jasem Email: yaser_ij@uodiyala.edu.iq
8. Course Objectives

Course Objectives	a) Introducing pollutants in general, whether they are air, water, or solid pollutants, especially those resulting from various industries. b) Introducing the harms resulting from these pollutants and their negative impact on human life and the surrounding soil, air, water, and all living organisms. c) Thus, finding the best appropriate methods (taking into account Cost factor) to reduce these pollutants or reduce their impact through designing the necessary equipment to reduce these pollutants or through the correct management of various wastes in a way that ensures the best environment with the least amount of pollutants possible to preserve life. d) Introducing food fortification technology and fortification requirements.

9. Teaching and Learning Strategies	
Strategy	•Teacher prepares lectures on the subject in electronic form and presents them to students. •The teacher gives lectures in detail. •The teacher requests periodic reports and homework on the main topics of the subject

10. Course Structure					
1-2	4		Identifying global environmental phenomena, their effects, and ways to reduce them and reduce their effects	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
3-4	4		Air pollution, air pollution classification, Gravitational settling .chambers	Lectures PDF power point Video in addition to the student's deductive questions	Classwork
5-6	4		Air pollution, air pollution classification, Cyclones	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams + monthly exams
7-8	4		Air pollution, Fabric filter +Electrostatic precipitators	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
9	2		Air pollution, Wet scrubbers, Advantages and Disadvantages of wet scrubbers	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
10	2		Water and wastewater treatment Water sources, pollutant in wastewater and their effects.	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams

11	2		wastewater treatment, Primary treatment, Pretreatment, Flotation, Sedimentation	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams + monthly exams
12	2		wastewater treatment, Secondary treatment, activated sludge system, Trickling-filter.	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
13-14	4		Tertiary treatment, Removal of suspended solids (SS) and BOD, nutrient removal, Chemical precipitation, Adsorption, Ion Exchange.	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
15	2		Definition of solid waste, its classification, and the environmental impacts resulting from its. And methods of managing it	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams

11.Cours 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 book, if any)

C.S.Rao , "Environmental Pollution Control Engineering", 2nd eddition , New Age International(P) Limited, Published, 2006, Reprint 2007.

Main references (source):

R. K. Sinnott, Chemical Engineering Design, Vol. 6. 4th edition, Chemical Engineering Design, 2005, pp. 450-457.

Noel de Never, "Air Pollution Control Engineering", McGrow-Hill, Inc 1987.
M. Grawford, "Air Pollution Control Theory", McGraw-Hill, New York, 1976.

Recommended book and references (scientific journals, reports …….):

M. M. Gilbert, "Introduction To Environmental Engineering And Science ", 2nd edition, Hall, Inc, New Jersey, 1998.

Electronic References, Website:

http://www.epd.gov.hk/epd/english/greenproperty/poll_pro/poll_pro_rec.html
http://www.eartheclipse.com/environment/causes-effects-solutions-to-environmental-pollution.html

Course Description Form

1. Course Name: Fluid Flow I
2. Course Code: Ch.E202 Fluid Flow II
3. Semester / Year: YEAR
4. Description Preparation Date: 30/4/2024
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total) 90
7. Course administrator's name (mention all, if more than one name)
Name: walaa abid Mahmood E- mail :whalaa_alkhaisi76@uodiyala.edu.iq
8. Course Objectives
Course objective .....
In physics and engineering, fluid dynamics is a sub discipline of fluid mechanics that describes the flow of fluids—liquids and gases understanding nebulae in interstellar space and modelling fission weapon detonation. In this Course student understand the physics of fluid and how to deal with it
It has several sub disciplines, including aerodynamics (the study of air and other gases in motion) and hydrodynamics (the study of liquids in motion)
Fluid dynamics has a wide range of applications, including calculating forces and moments on aircraft, determining the mass flow rate of petroleum through pipelines, predicting weather patterns

9. Teaching and Learning Strategies	
Strategies	• Teacher prepares lectures on the subject in electronic form and presents them to students. • The teacher gives lectures in detail. • The teacher requests periodic reports and homework on the main topics of the subject

10. Course Structure

Week	Hours	ILOs	Unit/Module or Topic Title	Teaching Method	Assessment Method
Week1-2	8		Pumping of Liquids Total heads, NPSH, Horse Power and cost consumption, Pumping Efficiencies, Characteristics curves,	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
Week 3-4	8		Types of the pumps, Selection of Pumps, Centrifugal pump relations, homologous centrifugal pump, centrifugal pumps in series and in parallel	Lectures PDF power point Video in addition to the student's deductive questions	Classwork
Week5-6	8		Newtonian's Fluid (Incompressible flow in Pipe and Channels) Reynolds experiment , Head losses (skin friction) in circular pipes for laminar flow by Hagen Poiseuille law and fore turbulent flow by Darcy equation, Head losses (form friction) in fittings, sudden expansion or contraction ,.	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams + monthly exams
Week 8-9	8		Flow Measurement (Practical Application of Bernoulli's Equation) Pitot tubes, orifice meter, venturi meter, nozzle meter, Rotameters other	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams

			types of flow meters, Fow in open channels and weirs.		
Week10	2		Tutorial		
Week 10	2		Midterm one		
Week 12-13-	8		Flow of Compressible Fluid General equation, equation of state, sonic velocity in fluids , calculation of pressure drop by Lockhart and Martinelli method.	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
Week 14-15	6		Isothermal, Non-isothermal and Adiabatic flow of an ideal gas in horizontal pipe, Converging-diverging nozzle for gas flow, Type of Compressor, Gas compression and compressors work and efficiency. Two Phase Flow, Flow regime, Pressure Momentum, and Energy relations,	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
Week 15			Midterm two		

11. Cours Evaluation	
1. Books Required reading:	1. Chem.. Eng. Vol. 1 2. Holand " fluid flow for chem.. eng. "
2. Main references (sources)	1. Unit operation of chem. eng. 2. Transport processes and unit operation 3. Hydraulics and fluid mechanics
A- Recommended books and references (scientific journals, reports…).	A text book of fluid mechanics
B-Electronic references, Internet sites…	Any book from website
12. The development of the curriculum plan	
Adding more experiment	

Course Description Form

1. Course Name: Fluid Flow I
2. Course Code: Ch.E202 Fluid Flow II
3. Semester / Year: YEAR
4. Description Preparation Date: 30/4/2024
5. Available Attendance Forms:
6. Number of Credit Hours (Total) / Number of Units (Total) 90
7. Course administrator's name (mention all, if more than one name)
Name: walaa abid Mahmood E- mail :whalaa_alkhaisi76@uodiyala.edu.iq
8. Course Objectives
• This semester is a continuation of the first semester, where the student understands the applications of the Bernoulli and Venturi equations in the operation of pumps • As well as learning about the types of Newtonian fluids and how to deal with them, and also learning about the devices for the flow meter. • Compressed fluids and their applications are also studied.

9. Teaching and Learning Strategies

- Daily discussion to determine the extent of students' understanding of the material and to evaluate the daily contributions.
- Daily exams with various short scientific questions to understand the extent of their understanding of the material.
- Giving part of each chapter's grade to homework assignments.
- Daily exams (COZs) and monthly exams for the curriculum and the final exam

Strategy	• Teacher prepares lectures on the subject in electronic form and presents them to students. • The teacher gives lectures in detail. • The teacher requests periodic reports and homework on the main topics of the subject

10. Course Structure

Week	Hours	Unit or subject name	Unit/Module or Topic Title	Teaching Method	**Evaluation** Method
Week1-2	8		Pumping of Liquids Total heads, NPSH, Horse Power and cost consumption, Pumping Efficiencies, Characteristics curves,	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
Week 3-4	8		Types of the pumps, Selection of Pumps, Centrifugal pump relations, homologous centrifugal pump, centrifugal pumps in series and in parallel	Lectures PDF power point Video in addition to the student's deductive questions	Classwork
Week5-6	8		Newtonian's Fluid (Incompressible flow in Pipe and Channels) Reynolds experiment , Head losses (skin friction) in circular pipes for laminar flow by Hagen Poiseuille law and fore turbulent flow by Darcy equation, Head losses (form friction) in fittings, sudden expansion or contraction ,.	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams + monthly exams
Week 8-9	8		Flow Measurement (Practical Application of Bernoulli's Equation) Pitot tubes, orifice meter, venturi meter, nozzle meter, Rotameters other types of flow meters, Fow in open channels and weirs.	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
Week10	2		Tutorial		
Week 10	2		Midterm one		
Week 12-13-	8		Flow of Compressible Fluid General equation, equation of state, sonic velocity in fluids , calculation of pressure drop by Lockhart and Martinelli method.	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
Week 14-15	6		Isothermal, Non-isothermal and Adiabatic flow of an ideal gas in	Lectures PDF power point	Daily exams

			horizontal pipe, Converging-diverging nozzle for gas flow, Type of Compressor, Gas compression and compressors work and efficiency. Two Phase Flow, Flow regime, Pressure Momentum, and Energy relations,	Video in addition to the student's deductive questions	
Week 15			Midterm two		

11. Infrastructure	
1. Books Required reading:	1. Chem.. Eng. Vol. 1 2. Holand " fluid flow for chem.. eng. "
2. Main references (sources)	1. Unit operation of chem. eng. 2. Transport processes and unit operation 3. Hydraulics and fluid mechanics
A- Recommended books and references (scientific journals, reports…).	A text book of fluid mechanics
B-Electronic references, Internet sites…	Any book from website
12. The development of the curriculum plan	
Adding more experiment	

Course Description Form

1. Course Name:
Principles of chemical engineering III
2. Course Code:
Ch. E.206
3. Semester / Year:
Semester 1 / Year 2
4. Description Preparation Date:
1-9-2023
5. Available Attendance Forms:
Full time attendance
6. Number of Credit Hours (Total) / Number of Units (Total)

45 hours / 2 units

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

Name: Dr. Mohammed Hamzah Msaed
Email: mhmmsaed1@uodiyala.edu.iq

8. Course Objectives

Course Objectives	Learn the basics of energy balance in the development of industrial and energy formulas and their transformations in with and without chemical reaction.

9. Teaching and Learning Strategies

Strategy	1. Lectures 2. Presenting Power point (PPT) slides 3. Problems discussion (Tutorial)

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	The ideal gas law	Ideal gases	1. Lectures(PPT) 2. Tutorial	Oral exam
2	3	1.Ideal gas mixtures 2.partial pressure	Ideal gases	1. Lectures(PPT) 2. Tutorial	Oral exam
3	3	1.Critical Parameters 2.Reduced Parameters	Critical Properties	1. Lectures(PPT) 2. Tutorial	Oral exam
4	3	1.Compressibility Factor 2.Equations of State	Real gases	1. Lectures(PPT) 2. Tutorial	Oral exam
5	3	1.Gaseous Mixtures 2.Vapor Pressure 3.Liquids	Real gases and liquids	1. Lectures(PPT) 2. Tutorial	Oral exam
6	3	Normal boiling point	Liquid properties	1. Lectures(PPT) 2. Tutorial	Oral exam
7	3	Antoine equation	Partial pressure	1. Lectures(PPT) 2. Tutorial	Oral exam
8	3	Material balances involving ideal gases	Ideal gases	1. Lectures(PPT) 2. Tutorial	Oral exam
9	3	Liquid Properties	Liquids	1. Lectures(PPT) 2. Tutorial	Oral exam
10	3	Vapor-Liquid Equilibrium for Multicomponent	Vapor-Liquid Equilibrium	1. Lectures(PPT) 2. Tutorial	Oral exam

		Systems			
11	3	Henry's law	Laws of gases	1. Lectures(PPT) 2. Tutorial	Oral exam
12	3	Raoult's law	Laws of gases	1. Lectures(PPT) 2. Tutorial	Oral exam
13	3	Bubble Point Temperature	Laws of gases	1. Lectures(PPT) 2. Tutorial	Oral exam
14	3	Dew Point Temperature	Laws of gases	1. Lectures(PPT) 2. Tutorial	Oral exam
15	3	Gibb's phase rule	Laws of gases	1. Lectures(PPT) 2. Tutorial	Oral exam

11.Cours 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	1. Himmelblau David M. "Basic Principles and Calculations in Chemical Engineering". 8th Ed. 2012. Prentice Hall PTR
Main references (source)	1.Felder Richard M., Rousseau Ronald W. "Elementary Principles of Chemical Processes" 3nd Ed. 2001. John Willey & Sons. 2. Reklaitis G.V., Schneider Daniel R. "Introduction to Material and Energy Balances" 1983. John Wiley & Sons. 3. Hougen Olaf A., Watson Kenneth M. "Chemical Processes Principles". 2004, John Wiley and Sons & CBS Publishers.
Recommended book and references	Chemical engineering journal
Electronic References , Website	

Course Description Form

1. Course Name:
Principles of chemical engineering IV
2. Course Code:
Ch. E.216
3. Semester / Year:
Semester 2 / Year 2
4. Description Preparation Date:
1-9-2023
5. Available Attendance Forms:
Full time attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
45 hours / 2 units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Mohammed Hamzah Msaed Email: mhmmsaed1@uodiyala.edu.iq
8. Course Objectives

Course Objectives	Learn the basics of energy balance in the development of industrial and energy formulas and their transformations in with and without chemical reaction.

9. Teaching and Learning Strategies

Strategy	4. Lectures 5. Presenting Power point (PPT) slides 6. Problems discussion (Tutorial)

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Introduction	1. Energy definition. 2. Energy forms.	1. Lectures(PPT) 2. Tutorial	Oral exam
2	3	Enthalpy	1. Latent heat of vaporization. 2. Enthalpy of reaction.	1. Lectures(PPT) 2. Tutorial	Oral exam

3	3	Energy balance	Energy balance without chemical reaction.	1. Lectures(PPT) 2. Tutorial	Oral exam
4	3	Energy balance	Energy balance with chemical reaction.	1. Lectures(PPT) 2. Tutorial	Oral exam
5	3	Energy balance	Application of energy balance in the industry.	1. Lectures(PPT) 2. Tutorial	Oral exam
6	3	Energy balance	Mechanical energy balance.	1. Lectures(PPT) 2. Tutorial	Oral exam
7	3	Heat of solution	Heat of solution calculation	1. Lectures(PPT) 2. Tutorial	Oral exam
8	3	Humidity	1. Definitions of different kinds of humidity. 2. Humidity charts and their uses.	1. Lectures(PPT) 2. Tutorial	Oral exam
9	3	Heat capacity	Heat capacity	1. Lectures(PPT) 2. Tutorial	Oral exam
10	3	Enthalpy	Enthalpy-concentration charts and their uses	1. Lectures(PPT) 2. Tutorial	Oral exam
11	3	Degree of freedom	Degree of freedom of systems	1. Lectures(PPT) 2. Tutorial	Oral exam
12	3	Material and energy balance	Material and energy balance for complete projects.	1. Lectures(PPT) 2. Tutorial	Oral exam
13	3	Material and energy balance	Material and energy balance for complete projects.	1. Lectures(PPT) 2. Tutorial	Oral exam
14	3	Unsteady State energy balance	Unsteady state material balance	1. Lectures(PPT) 2. Tutorial	Oral exam
15	3	Unsteady State energy balance	Unsteady State energy balance	1. Lectures(PPT) 2. Tutorial	Oral exam

11.Cours 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	2. Himmelblau David M. "Basic Principles and Calculations in Chemical Engineering". 8th Ed. 2012. Prentice Hall PTR
Main references (source)	4.Felder Richard M., Rousseau Ronald W. "Elementary Principles of Chemical Processes" 3nd Ed. 2001. John Willey & Sons. 5. Reklaitis G.V., Schneider Daniel R. "Introduction to Material and Energy Balances" 1983. John Wiley & Sons. 6. Hougen Olaf A., Watson Kenneth M. "Chemical Processes Principles". 2004, John Wiley and Sons & CBS Publishers.
Recommended book and references	Chemical engineering journal
Electronic References , Website	

THIRD STAGE

Course Description Form

1. Course Name: Economic Engineering
2. Course Code:
3. Semester / Year: 2nd Semester –
4. Description Preparation Date:
30/4/2024
5. Available Attendance Forms:
Class Lectures
6. Number of Credit Hours (Total) / Number of Units (Total)
30 hours
7. Course administrator's name (mention all, if more than one name)
Name: walaa abid Mahmood *E-mail whalaa_alkhaisi76@uodiyala.edu.iq*
8. Course Objectives

Course Objectives	. • Studying the concept of economics and its impact on the labor market: estimating the cost of industrial projects, factors affecting the cost of production and investment • Capital investment, cost index, investment profit and cost, depreciation, optimized design, cost of block and heat transfer equipment
9. Teaching and Learning Strategies	
Strategy	• The lecturer prepares lectures on the subject in paper and electronic form and presents them to the students. • The lecturer delivers lectures in detail. • The lecturer requests periodic reports and homework assignments on the basic topics of the subject.

10. Course Structure					
Week	**Hours**	**Required Learning method**	**Unit or subject name**	**Learning method**	**Learning method**
Week 1	2	Learn about the concept of economics and how it is classified	Introduction to economic in industries process	Lectures Notes PDF power point	Unannounced exams and self-evaluation during the lecture
Week 2-3	4	Identify and calculate the cost of projects	Estimation of cost of industrial projects	Lectures Notes PDF power point	Unannounced exams and self-evaluation during the lecture
Week 4-5	2	Factors affecting production and investment	Factors affecting the production cost and investment	Lectures Notes PDF power point	Unannounced exams and self-evaluation during the lecture
Week 6 - 7	4	Capital investment, Cost index, Profit and cost of investment,	Methods of calculating total and operating capital investment	Lectures Notes PDF power point	Unannounced exams and self-evaluation during the lecture
Week 8	Midterm one				
Week 9- to Week 15		Depreciation	Depreciation and its types	Lectures Notes PDF power point	Unannounced exams and self-evaluation during the lecture

Week 13		Heat transfer cost	How the cost of heat transfer effect on the market	Lectures Notes PDF power point	
Week 14	Project for students				
Week	Midterm two				

11. Course Evaluation	
Distributing the score out of 100 according to the tasks assigned to the student sich as daily preparation, daily oral, monthly, or written exam, report … etc	
12. Learning and Teaching Resources	
Books Required reading:	**PROCESS ENGINEERING ECONOMICS** **James R. Coup** **University of Arkansas** **Fayetteville, Arkansas, US. A.**
Electronic references, Internet sites…	• http://www.dekker.com

Course Description Form

1. Course Name:
Management industrial
2. Course Code:
Ch.E308
3. Semester / Year: 2nd Semester –
Third class /first semester
4. Description Preparation Date:
30/4/2024
5. Available Attendance Forms:
Class Lectures
6. Number of Credit Hours (Total) / Number of Units (Total)
30 hours
7. Course administrator's name (mention all, if more than one name)
Name: ***walaa abid Mahmood***   **Email:*****whalaa_alkhaisi76@uodiyala.edu.iq***
8. Course Objectives

Course Objectives	The student learns about management and practice: functions of management, Hawthorne experiments, leadership styles, and motivational theories. Marketing Management: Marketing management process, product life cycle, and marketing strategies. Operations Management: Productivity and Work Study, Operations Strategy, Statistical Process Control, Taguchi Parametric Design, Quality Function Deployment, Introduction to Total Quality Management, and ISO 9000. Project Management: Planning Projects, Feasibility Analysis, and Project Scheduling Methods.

9. Teaching and Learning Strategies	
Strategy	• The lecturer prepares lectures on the subject in paper and electronic form and presents them to the students. • The lecturer delivers lectures in detail. • The lecturer requests periodic reports and homework assignments on the basic topics of the subject.

10. Course Structure					
Week	**Hours**	**Required Learning method**	**Unit or subject name**	**Learning method**	**Learning method**
Week 1 to Week 2	4	Management theory and practice: functions of management	Students know management and its most important basic functions	Lectures Notes PDF power point Video	Unannounced exams and self-evaluation during the lecture
Week 3 -5	6	Production and types of it	Study production in the market and know its types	Lectures Notes PDF power point Video	Unannounced exams and self-evaluation during the lecture
Week 6	Midterm one				
Week 7 to Week 9	6	Marketing management: Marketing management process, product life cycle and marketing strategies.	Marketing and its strategies	Lectures Notes PDF power point Video	Unannounced exams and self-evaluation during the lecture
Week 10 -11	4	Productivity and work study, Introduction to Total Quality	Productivity and its importance	Lectures Notes PDF power point Video	Unannounced exams and self-evaluation during the lecture
Week 12-13	4	Management, and ISO 9000.	Students know ISO how to play a good role in the market	Lectures Notes PDF power point Video	Unannounced exams and self-evaluation during the lecture
Week 14	2	Project			
Week 15	Midterm two				

11. Course Evaluation	
Distributing the score out of 100 according to the tasks assigned to the student sich as daily preparation, daily oral, monthly, or written exam, report … etc	
12. Learning and Teaching Resources	
Books Required reading:	• Lectures by the subject teacher and any book from the library related to industrial management
Electronic references, Internet sites…	• Any other materials available on the web.

Course Description Form

1. Course Name: **Chemical &Petrochemical Industries**	
2. Course Code: **CHE 315**	
3. Semester/Year: **Second Semester**	
4. DescriptionPreparationDate:**28-4-2024**	
5.Available Attendance Forms: **Weekly lectures**	
6.Number of Credit Hours (Total)/Number of Units(Total): **75**	
7.Courseadministrator's name (mentionall,if morethanone name)	
Name: Ass. Prof. Dr. Adiba A. Mahmmod Email: alnuimiadiba@uodiyala.edu.iq	
8. Course Objectives	
Course Objectives	Giving the student an overview of the principles and concepts of statistics and probability, and making the student able to represent data in the form of tables and graphics. Differentiate between quantitative and qualitative data and how they are represented. Knowing the types of descriptive measures such as arithmetic mean, frequency, range, amount of change and standard deviation. Knowledge of the principles of probability and its types and the laws of multiplication, addition and continuity in addition to the use of the laws of permutations and combinations in finding probability. Make the student able to know the types of distribution such as the normal distribution and use it to represent the types of probability.

9. Teaching and Learning Strategies

Strategy	1- Lectures. 2- Presenting power point slides. 3- Collect data and prepare reports. 4- Discussions.

10. Course Structure

Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1	3	Introduction to petrochemical (olefins and aromatics)	Production of the basic materials for the petrochemical Industry (olefins and aromatics)	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
2-3	6	Production of Ethylene	Petrochemicals from methane& Ethylene	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
4-5	6	Production of Thermoplastic	Propylene derivatives Thermoplastic& Thermoset Industrial fibers & rubber	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
6-7	6	Explain in detail the industries of Ceramic , glass, nitric acid	Ceramic , glass, nitric acid	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
8	3	semester exam			
9-10	6	Explain in detail the industries of Paper, rubber , fibers ,cement & Fertilizers	Paper, cement & Fertilizers	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
11-12	6	Description the industrial of carbon & Sulphuric Acid	Industrial of carbon & Sulphuric Acid	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
13	3	Explain the concept of Gases(carbon dioxide,ammonia)	Gases(carbon dioxide,ammonia)	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
14	3	Explain the concept of nitrogen,helium and oxygen Soap &Detergents Sugar	Nitrogen,helium and oxygen Soap &Detergents Sugar	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
15	3	semester exam			

11.Cours 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
\
5- **Shereve's Chemical Process Industries, fifth edition,George T. Austin**.
\
1- Electronic References , Website : http://www.wolframalpha.com/widgets/view.jsp?id=e602dcdecb1843943960b5197efd3f2a 2- https://www.symbolab.com/solver/series-calculator 3- https://matrixcalc.org/en/vectors.html

Course Description Form

1. Course Name:
Heat Transfer I
2. Course Code:
Ch.E305
3. Semester / Year:
first Semester
4. Description Preparation Date:
5. Available Attendance Forms: **Weekly lectures**
28-4-2024
6. Number of Credit Hours (Total) / Number of Units (Total): **75**
75/ 3
7. Course administrator's name (mention all, if more than one name)
Name: Mustaf Sabah Email: mustafa.sabah@uodiyala.edu.iq

8. Course Objectives	
Course Objectives	The primary aim of teaching heat transfer to chemical engineering students is to equip them with a fundamental understanding of heat transfer principles and their applications in the chemical industry. Specific objectives include: Developing a strong foundation in the modes of heat transfer (conduction, convection, and radiation). Understanding the mathematical models and equations used to analyze heat transfer processes. Applying heat transfer principles to solve practical engineering problems in areas such as process design, equipment selection, and energy efficiency. Developing skills in experimental techniques for heat transfer measurements and analysis. Fostering the ability to analyze and troubleshoot heat transfer issues in industrial processes. Cultivating a strong problem-solving approach to heat transfer challenges.

9. Teaching and Learning Strategies

Strategies	1- Lectures. 2- Presenting power point slides. 3- Collect data and prepare reports. 4- Discussions.

10. Course Structure

Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1	4	Students should understand the fundamental concepts of heat transfer and its relevance to chemical engineering processes.	Introduction to Heat Transfer	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
2-3	8	Students should understand applications of heat transfer in industry	Importance of heat transfer in chemical engineering, Applications of heat transfer in industry	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
4-5	8	Students must understand basic thermodynamic principles to analyze heat transfer.	Basic Concepts of Thermodynamics	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
6-7	8	Students should be able to analyze heat transfer through solid bodies and calculate heat transfer rates in different configurations.	Fourier's law of heat conduction, Thermal conductivity	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
8	4		semester exam		
9-10	8	Students should be able to deal with more complex heat transfer problems that involve transfer through more than one dimension.	Steady-state conduction in one, two, and three dimensions, Thermal resistance	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
11-12	8	Students should be able to deal with more complex heat transfer problems involving multiple materials.	Series and parallel thermal resistances, Critical thickness of insulation for composite walls, Heat transfer through cylindrical and spherical walls	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
13	4	Students should be able to deal with more complex	Unsteady-State Conduction, Lumped capacitance	Lectures, presentations, and	Unannounced exams and self-

		and time-dependent heat transfer problems.	method, Biot and Fourier numbers, Temperature distribution in solids	reports	assessment during the lecture
14	4	Students should be able to deal with problems of intense heat transfer through fins	Types of fins, Fin efficiency and effectiveness, Heat transfer from fins	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
15	4	semester exam			

11.Cours 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
Heat Transfer by Jack Holman
Heat Transfer; A Practical Approach by cengel
International journal of heat and mass transfer.
science direct

Course Description Form

1. Course Name:
Heat transfer II
2. Course Code:
Ch.E313
3. Semester / Year: **Second Semester**
4. Description Preparation Date: **28-4-2024**
5. Available Attendance Forms: **Weekly lectures**
6. Number of Credit Hours (Total) / Number of Units (Total): **30**
7. Course administrator's name (mention all, if more than one name)

Name: Mustafa S Mahdi
Email: mustafa.sabah@uodiyala.edu.iq

8. Course Objectives

Course Objectives	The primary aim of teaching heat transfer to chemical engineering students is to equip them with a fundamental understanding of heat transfer principles and their applications in the chemical industry. Specific objectives include: Developing a strong foundation in the modes of heat transfer (conduction, convection, and radiation). Understanding the mathematical models and equations used to analyze heat transfer processes. Applying heat transfer principles to solve practical engineering problems in areas such as process design, equipment selection, and energy efficiency. Developing skills in experimental techniques for heat transfer measurements and analysis. Fostering the ability to analyze and troubleshoot heat transfer issues in industrial processes. Cultivating a strong problem-solving approach to heat transfer challenges

9. Teaching and Learning Strategies

Strategies	1- Lectures. 2- Presenting power point slides. 3- Collect data and prepare reports. 4- Discussions.

10. Course Structure

Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1	4	Students should be able to differentiate between internal and external forced convection, apply dimensionless numbers to analyze flow and heat transfer, and use correlation equations to estimate heat transfer coefficients	Concept of forced convection, Boundary layer theory,	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
2-3	8	Students should be able to differentiate between internal and external forced convection, apply dimensionless numbers to analyze flow and heat transfer, and use correlation equations to estimate heat transfer coefficients	Dimensionless numbers (Reynolds, Prandtl, Nusselt),	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
4-5	8	Students should be able to differentiate between internal and external forced convection, apply dimensionless numbers to analyze flow and heat transfer, and use correlation equations to estimate heat transfer coefficients	Correlation equations for heat transfer coefficient in internal and external flows	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
6-7	8	Students should understand the principles of natural convection, apply the	Concept of natural convection, Grashof number, Correlation	Lectures, presentations, and reports	Unannounced exams and self-assessment during

		Grashof number to analyze flow and heat transfer, and consider the effects of combined forced and natural convection	equations for natural convection heat transfer		the lecture
8	4	semester exam			
9-10	8	Students should be able to classify different types of heat exchangers, understand the concept of overall heat transfer coefficient, and account for fouling effects	Classification of heat exchangers,	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
11-12	8	Students should be able to classify different types of heat exchangers, understand the concept of overall heat transfer coefficient, and account for fouling effects	Overall heat transfer coefficient (U), Fouling factors	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
13	4	Students should be able to calculate heat transfer rates in heat exchangers using LMTD and effectiveness-NTU methods, and analyze the impact of fouling on heat exchanger performance	Log mean temperature difference (LMTD),	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
14	2	Students should be able to calculate heat transfer rates in heat exchangers using LMTD and effectiveness-NTU methods, and analyze the impact of fouling on heat exchanger performance	Effectiveness-NTU method, Fouling and its effects on heat exchanger performance	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
15	4	semester exam			

11.Cours 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

Heat Transfer by Jack Holman

Heat Transfer; A Practical Approach by cengel

International journal of heat and mass transfer.

science direct

Course Description Form

1. Course Name:
Engineering combustion
2. Course Code: **CHE**
Ch.E312
3. Semester / Year: **Second Semester**
4. Description Preparation Date: **28-4-2024**
5. Available Attendance Forms: **Weekly lectures**
6. Number of Credit Hours (Total) / Number of Units (Total):
30/2
7. Course administrator's name (mention all, if more than one name)
Name: Email: Mustafa S Mahdi mustafa.sabah@uodiyala.edu.iq
8. Course Objectives

Course Objectives	To provide students with a fundamental understanding of combustion principles, enabling them to analyze, design, and optimize combustion processes for various engineering applications. Specific Objectives: Define combustion and its significance in engineering. Classify fuels and understand their properties relevant to combustion. Apply thermodynamic principles to combustion processes. Analyze combustion products and their impact on environmental issues. Understand the concept of stoichiometry and air-fuel ratios. Explore combustion kinetics and flame propagation. Evaluate combustion equipment and systems. Apply combustion principles to practical engineering problems.

9. Teaching and Learning Strategies

Strategy	1- Lectures. 2- Presenting power point slides. 3- Collect data and prepare reports. 4- Discussions.

10. Course Structure

Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1	2	Students should understand the basic concepts of combustion, differentiate between complete and incomplete combustion, and recognize the importance of combustion in various engineering field	Combustion Fundamentals, Definition of combustion	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
2-3	4	Students should understand the basic concepts of combustion, differentiate between complete and incomplete combustion, and recognize the importance of combustion in various engineering field	Types of combustion (complete and incomplete), Combustion products, Importance of combustion in engineering applications	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
4-5	4	Students should be able to classify different types of fuels, understand fuel properties, and calculate the stoichiometric air-fuel ratio for combustion process	Types of fuels (solid, liquid, gaseous), Fuel properties (calorific value, composition)	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
6-7	4	Students should be able to classify different types of fuels, understand fuel properties, and calculate the stoichiometric air-fuel ratio for combustion process	Air composition and requirements for combustion, Stoichiometric air-fuel ratio	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
8	2	semester exam			
9-10	4	Students should understand the thermodynamic principles of combustion, calculate adiabatic flame temperature, and determine heat of reaction	First and second laws of thermodynamics applied to combustion, Adiabatic flame temperature	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
11-12	4	Students should understand the thermodynamic principles of combustion, calculate adiabatic flame temperature, and determine heat of reaction	Enthalpy of formation and combustion, Heat of reaction	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
13	2	Students should understand the concept of chemical equilibrium in combustion, calculate equilibrium constants, and analyze the effects of temperature and pressure on equilibrium	Chemical equilibrium in combustion processes, Equilibrium constant	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
14	2	Students should understand the concept of chemical equilibrium in combustion, calculate equilibrium constants, and analyze the effects of temperature and pressure on equilibrium	Effect of temperature and pressure on equilibrium	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
15	2	semester exam			

11.Cours 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
Fundamentals of Combustion Processes by Forman A. Williams
Combustion: Physical and Chemical Fundamentals by Irvin Glassman.
Applied thermal eng.
science direct

Course Description Form

1. Course Name:	
Food Engineering	
2. Course Code:	
Ch.E304	
3. Semester / Year:	
Semester/ 1	
4. Description Preparation Date:	
30/4/2024	
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: Yaser I. Jasem Email: yaser_ij@uodiyala.edu.iq	
8. Course Objectives	
Course Objectives	a) Giving an introduction to the foundations of food engineering. b) Identifying the most important goals of the food industry, in addition to the most important challenges facing food industry operations, and the future outlook for food engineering in facing these challenges. c) Introducing the basic components of food and their most important sources. d) Introducing food fortification technology and fortification requirements. e) Introducing the applications of enzymes in foods, in addition to the safety and security issues used in the food industries. f) Introducing food manufacturing processes in full detail, in addition to the applications of membranes in the food industry. g) Introducing food packaging methods in addition to the materials used in this regard and others.
9. Teaching and Learning Strategies	

Strategies	•Teacher prepares lectures on the subject in electronic form and presents them to students. •The teacher gives lectures in detail. •The teacher requests periodic reports and homework on the main topics of the subject

10. Course Structure

Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1-2	4		- Engineering challenges in the Food Processing Industry - Basic Food Biochemistry and Microbiology	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
3-4	4		- Food Constituents -Food Fortification	Lectures PDF power point Video in addition to the student's deductive questions	Classwork
5-6	4		- Enzymes and Application in Food Processing -Food Safety	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams + monthly exams
7-8	4		- Ambient-Temperature Processing	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
9	2		Wet and Dry cleaning	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
10	2		- Membrane Concentration Fermentation	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
11-12	4		Thermal Processing	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams + monthly exams
13	2		Infrared Heating	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams
14-15	4		Packaging	Lectures PDF power point Video in addition to the student's deductive questions	Daily exams

11.Cours 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 book , if any)
Main references (source)**:** 1- Fellows, P., Food Processing Technology: Principles and Practice, 2nd Edition, Woodhead Publishing Ltd., England, 2000. 2- James G. Brennan, Food Processing Handbook: WILEY-VCH Verlag GmbH & Co. KGaA, 2006.
Recommended book and references (scientific journals, reports …….): 1- Toledo, R, Fundamentals of Food Process Engineering, 3rd Edition, Springer, 2010. 2- Da-Wen Sun, Thermal Food Processing: New Technologies and Quality Issues, Taylor & Francis Group, 2006.
Electronic References, Website: Any book deal with food engineering from website

FOURTH STAGE

Course Description Form

1. CourseName:
Control process II
2. Course Code:
Ch.E410
3. Semester/Year:
Course I 2024
4. Description Preparation Date:
4-4-2024
5.AvailableAttendanceForms:
6.Number of Credit Hours (Total)/Number of Units (Total)
60/ 3
7.Courseadministrator's name (mention all, if more than one name)
Name:
8. Course Objectives

Course Objectives	1. To enhancement the ability of students for the analysis of closed-loop system and response of controlled system under different operating conditions. 2. Construction of transfer function of the closed system for different schemes. 3. Provide practice of tuning of controller parameters and limiting of stable operating conditions. 4. Motivation and encourage the students for solving open ended problems

9. Teaching and Learning Strategies	
Strategy	Course divide to attendance lectures, tutorials, Exam, Assignments , and reports.

10. Course Structure

Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1	3	Transient Response of complex Control Systems		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
2,3	6	• Transient Response of complex Control Systems		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
4	3	Stability		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
5	3	Introduction to Frequency Response, Bode Diagrams		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
6		System Design by Frequency Response .		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.

7	3	Ziegler-Nichols Controller Settings.		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
8	3	• Pneumatic Controller Mechanisms		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
9,10	6	Industrial Pneumatic Controller		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
11	3	Control of Complex Processes		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
12	3	Control of Distillation Column		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.

13	3	Control of Heat Exchanger		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
14	3	• Control of Chemical Reactor		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
15	3	Feed-forward Control, Ratio Control		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
16	3	• Computer Control Loops		• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.

11.Cours Evaluation

1. Quizzes: - There will be (4) closed books and notes quizzes during the semester. - The quizzes will count 7% of the total module grade.
2. Mid-Term Test, 1 Nos. and will count 10% of the total module grade.
3. Homework and assignments, and will count 7% of the total module grade.
4. Seminars and oral & ppt. presentations, and will count 6% of the total module grade.
5. Extracurricular Activities, this is optional and will count extra marks (1–5%) for the student, depending on the type of activity.
6. Final Exam: - The final exam will be comprehensive, closed books and notes, and will take place on (Saturday-6 th - January / 20) from 9:00 AM - 12:00 PM in rooms () - The final exam will count 70% of the total module grade

12.Learning and Teaching Resources

1. D.R. Coughanowr and S. LeBlanc, Process Systems Analysis and Control, McGraw-Hill, 3nd edition, 2008.
2. Stephanopoulos G., "Chemical Process Control-An Introduction to Theory and Practice, "Prentice -Hall, New Jersey, 1984.

Other support books :-

1. Luyben W. L., "Process Modeling, Simulation and Control for Chemical Engineers," McGraw-Hill, New York, 2nd Ed., 1990 .
2. *Process Dynamics: Modeling, Analysis and Simulation, by Wayne Bequette.*

Course Description Form

1. Course Name:
Unit Operation I
2. Course Code:
Ch. E402
3. Semester / Year:
Courses
4. Description Preparation Date:
21/7/2024
5. Available Attendance Forms:
Available forms of attendance: direct attendance (in the hall) or indirect (e-learning)
6. Number of Credit Hours (Total) / Number of Units (Total)
60 hrs/ (4 Units)
7. Course administrator's name (mention all, if more than one name)
Name: Lec. Dr. Muwafaq Mahdi Abd Email: muwafaq8@uodiyala.edu.iq

8. Course Objectives	
Course Objectives	(1) Accomplishing the university's goals within the field of chemical engineering; (2) gives a sound education in the basics of chemical engineering; (3) develop the skills and confidence necessary to solve, based on engineering and scientific principles, problems in the biochemical, chemical and other industries; (4) continue to find graduates of high caliber; (5) Providing education compatible with the needs of the labor market linked to the Syndicate of Chemical Engineers.
9. Teaching and Learning Strategies	
Strategies	➢ Theoretical lectures with the use of illustrations. ➢ Practical laboratory application of concepts taught theoretically ➢ Assigning students to perform seminars by assigning them a topic to be discussed by their colleagues ➢ Solve problems, discuss them, and assign students some homework and reports through the e-learning platform

10. Course Structure

Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1	4	1. Units Operation (physical). 2. Units Operation (chemical). 3. Raw materials, processes and products. 4. Basic principles of units operation. The type of operations, the forces responsible for them, and the resistance for each type.	Introduction to the unit operation	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
2-4	8	1. Types of fluid flow Molecular diffusion, Eddy motions.	Momentum, mass and heat transfer	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
5-6	8	1- Reynolds' theory momentum, and heat transfer Reynolds' developed theory of heat and mass.	Reynolds Analogy	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
7-9	12	1. How the boundary layer develops. 2. The boundary layer in the stratigraphic and turbulent flow. 3. Coefficient of friction in turbulent flow. 4. Application of the boundary layer theory in tube flow The boundary layer in heat transfer.	Boundary layer	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
10-11	8	1. Free and aggregated sedimentation 2. The theory of the motion of molecules in a fluid 3. Equations of falling velocity Sedimentation devices	Solid particles movement through fluids	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
12-13	8	1. Darcy's equation and transmittance 2. Kozeny–Carman equation and its hypotheses. Retained fluid	The flow through the backed bed	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
14-15	8	1. Using Fluidization advantages and disadvantages 2. Types of Fluidization 3. Calculate the initial liquefaction speed Arkin equation	Fluidization	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture

11.Cours Evaluation

• Sudden exams (5 Marks).
• Monthly exams (25) marks
• Seminars + homework (5 marks).
• Reports (5) degrees
• A final examination of the curriculum (60 Marks).

12. Learning and Teaching Resources

1- Required prescribed books	1. Martin R., Introduction to Particle Technology, Second edition, John Wiley & Sons, Ltd. 2008. 2. McCabe W.L., Smith J.C. & Harriott P., Unit Operations of Chemical Engineering, Fifth edition, McGraw Hill. 1993.
2- Main references (sources)	1. Coulson J.M. & Richardson J.F., Chemical Engineering, Volume 1, six edition, ELBS, Pergamum Press. 2002. 2. Coulson J.M. & Richardson J.F., Chemical Engineering, Volume 2, Fifth edition, ELBS, Pergamon Press. 2002.
Mainstream recommended books and references (scientific journals, Reports.....)	• Chemical Engineering Journal • Chemical Engineering Science
Electronic references and websites	• The ChemEng Student Blog • The Chemical Engineer. • AIChE | All Conferences & Events

Course Description Form

1. Course Name:
Unit Operation II
2. Course Code:
Ch. E409
3. Semester / Year:
Courses
4. Description Preparation Date:
21/7/2024
5. Available Attendance Forms:
Available forms of attendance: direct attendance (in the hall) or indirect (e-learning)
6. Number of Credit Hours (Total) / Number of Units (Total)
60 hrs/ (4 Units)
7. Course administrator's name (mention all, if more than one name)
Name: Lec. Dr. Muwafaq Mahdi Abd Email: muwafaq8@uodiyala.edu.iq

8. Course Objectives	
Course Objectives	(1) Accomplishing the university's goals within the field of chemical engineering; (2) gives a sound education in the basics of chemical engineering; (3) develop the skills and confidence necessary to solve, based on engineering and scientific principles, problems in the biochemical, chemical and other industries; (4) continue to find graduates of high caliber; (5) Providing education compatible with the needs of the labor market linked to the Syndicate of Chemical Engineers.
9. Teaching and Learning Strategies	
Strategies	➢ Theoretical lectures with the use of illustrations. ➢ Practical laboratory application of concepts taught theoretically ➢ Assigning students to perform seminars by assigning them a topic to be discussed by their colleagues ➢ Solve problems, discuss them, and assign students some homework and reports through the e-learning platform

10. Course Structure

Week	Hours	The output requirements	Unit or subject name	Learning Method	Evaluation method
1-4	16	5. Type of Filters, Filtration theory 6. Plate and frame filter press, leaf filter. 7. Basic principles of unit operation. 8. filtration at Constant ΔP 9. Filtration at Constant rate Washing Time.	Filtration	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
5-6	8	1. Membrane Separation Process. 2. Molecular diffusion, Eddy motions.	Mechanical Separation	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
7-10	16	5. Introduction and general Principle in drying. 6. Rate of drying, the mechanism of moisture movement. 7. Calculation of rate of drying, moisture transport in Solids at Constant in Continuous dryers. 8. Types of Dryers and falling rate Period Capillary movement	Drying	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
11-13	10	1. Temperature humidity Chart for air – water system 2. Enthalpy – humidity – temperature chart 3. Addition of Vapor or liquid Stream to a gas stream.	Humidification	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture
13-15	10	1. Evaluation of heat and Mass transfer Coefficient 2. Cooling tower, height of Packing in Cooling towers 3. Minimum gas Condition	Mechanism of dehumidification	Lectures, presentations, and reports	Unannounced exams and self-assessment during the lecture

11.Cours Evaluation

• Sudden exams (5 Marks).
• Monthly exams (25) marks
• Seminars + homework (5 marks).
• Reports (5) degrees
• A final examination of the curriculum (60 Marks).

12. Learning and Teaching Resources

1- Required prescribed books	3. Martin R., Introduction to Particle Technology, Second edition, John Wiley & Sons, Ltd. 2008. 4. McCabe W.L., Smith J.C. & Harriott P., Unit Operations of Chemical Engineering, Fifth edition, McGraw Hill. 1993.
2- Main references (sources)	3. Coulson J.M. & Richardson J.F., Chemical Engineering, Volume 1, six edition, ELBS, Pergamum Press. 2002. 4. Coulson J.M. & Richardson J.F., Chemical Engineering, Volume 2, Fifth edition, ELBS, Pergamon Press. 2002.
Mainstream recommended books and references (scientific journals, Reports.....)	• Chemical Engineering Journal • Chemical Engineering Science
Electronic references and websites	• The ChemEng Student Blog • The Chemical Engineer. • AIChE | All Conferences & Events

Course Description Form

1. Course Name:
Petroleum Refinery I
2. Course Code:
Ch.E412
3. Semester / Year:
Course I / 2024
4. Description Preparation Date:
22/7/2024
5. Available Attendance Forms:
Mandatory attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
3 hrs/ 2 units
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Alyaa Mohammed Awad **Email: dr.Alyaa8934@gmail.com**
8. Course Objectives

Course Objectives	1. Basic understanding of refining processes: Provide students with basic knowledge about the various processes used in petroleum refining, such as distillation, chemical separation, and hydrotreatment. 2. Practical applications: Teaching students how to apply theoretical knowledge in practical contexts, such as operating and maintaining refining equipment and using modern technology in industry. 3. Problem analysis and solution: Develop students' critical and analytical thinking skills so they can analyze problems related to oil refining and find appropriate solutions. 4. Occupational safety and health: Emphasizing the importance of occupational safety and health procedures in the refining environment, and teaching students how to recognize and deal with hazards. 5. Environmental Impact: Educating students about the environmental impacts of refining processes and how to reduce harmful emissions and waste. 6. Technological developments: Introducing students to the latest technological developments in the field of oil refining and how to benefit from them to improve the efficiency of operations. 7. Economic aspects: Understanding the economic dimensions of refining operations, including costs, returns, and financial challenges associated with the industry

9. Teaching and Learning Strategies

Strategy	• Explaining basic concepts: Providing theoretical lectures that explain the basic processes of oil refining. • Use teaching aids: Make use of presentations, diagrams, and videos to explain processes and concepts clearly. • Group Discussions: Organizing group discussions to stimulate critical thinking and exchange of ideas among students. • Organizing field visits to oil refineries to familiarize students with the practical environment. • Providing constructive feedback to improve performance. • Providing digital study materials to provide easy access to information. • Promoting awareness of the importance of safety in the work environment.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	At the end of this learning unit, the student is able to : **1.** Explain the different processes of oil refining such as distillation, chemical separation, and hydrotreatment. **2.** Identify the different stages in the refining process and the devices used in it. **3.** Using modern technologies in refining operations and analyzing their results. **4.** Analyze problems related to oil refining using critical thinking skills. **5.** Proposing effective solutions to operational and technical problems in refineries. **6.** Apply	Petroleum Processing Overview. History of Petroleum Production	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
2	3		What is Petroleum, History of Petroleum Processing,	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
3	3		Modern Petroleum Processing.	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
4	3		Refinery Feed-stocks and Products	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
5	3		Thermo-physical Properties of Petroleum Fractions and Crude Oils	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams

6	3	occupational safety and health procedures in the refining environment. **7.** Identify potential risks and how to deal with them to reduce accidents. **8.** Keeping up with the latest technological developments in the field of oil refining. **9.** Applying modern technology to improve process efficiency and reduce costs. **10.** Contributing to research and development to develop new technologies and methods in oil refining. **11.** Providing new ideas to improve operations and increase their efficiency. **12.** Analysis of costs and returns associated with refining operations. Understand the financial challenges facing the refining industry and how to overcome them. 13.Understand the	Specific Gravity, Boiling Point Curves, Breakup of TBP Curve into Pseudo-components, Thermo-physical Properties Calculation	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
7	3		Crude Distillation Desalting Crude Oils	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
8	3		First exam - first semester	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
9	3		Crude Distillation Desalting Crude Oils	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
10	3		Atmospheric Distillation Unit	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
11	3		Material and Energy Balances	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams

12	3	financial challenges facing the refining industry and how to overcome them.	Reflux, Over flash, Overhead Temperature.	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
13	3		Side Draw Temperature	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
14	3		Bottom Temperature, Tower Diameter	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
15	3		Vacuum Distillation Unit.	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams

11.Cours Evaluation

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

12. Learning and Teaching Resources

- **W.L. Nelson, Petroleum Refinery Engineering, 1991, MacGraw Hill.**
- **S. Parkash, Refining Processes Handbook, 2003, Elsevier / GPP.**
- **Fahim, Mohamed A., Taher A. Al-Sahhaf, and AmalElkilani. Fundamentals of petroleum refining. Elsevier, 2009.**
- **G.D. Hobson:, Modern Petroleum technology, 1991, Applied Sc. Publisher**
- **J.H. Cary and G.E Handwork,Petroleum Refinery Technology & Economics , ,2001Dekker**
- **Oil and Gas Journal**

Course Description Form

1. Course Name:	
Petroleum Refinery II	
2. Course Code:	
Ch.E412	
3. Semester / Year:	
Course II / 2024	
4. Description Preparation Date:	
22/7/2024	
5. Available Attendance Forms:	
Mandatory attendance	
6. Number of Credit Hours (Total) / Number of Units (Total)	
3 hrs/ 2 units	
7. Course administrator's name (mention all, if more than one name)	
Name: Dr. Alyaa Mohammed Awad **Email: dr.Alyaa8934@gmail.com**	
8. Course Objectives	
Course Objectives	1. Basic understanding of refining processes: Provide students with basic knowledge about the various processes used in petroleum refining, such as distillation, chemical separation, and hydrotreatment. 2. Practical applications: Teaching students how to apply theoretical knowledge in practical contexts, such as operating and maintaining refining equipment and using modern technology in industry. 3. Problem analysis and solution: Develop students' critical and analytical thinking skills so they can analyze problems related to oil refining and find appropriate solutions. 4. Occupational safety and health: Emphasizing the importance of occupational safety and health procedures in the refining environment, and teaching students how to recognize and deal with hazards. 5. Environmental Impact: Educating students about the environmental impacts of refining processes and how to reduce harmful emissions and waste. 6. Technological developments: Introducing students to the latest technological developments in the field of oil refining and how to benefit from them to improve the efficiency of operations. 7. Economic aspects: Understanding the economic dimensions of refining operations, including costs, returns, and financial challenges associated with the industry
9. Teaching and Learning Strategies	

Strategy	• Explaining basic concepts: Providing theoretical lectures that explain the basic processes of oil refining. • Use teaching aids: Make use of presentations, diagrams, and videos to explain processes and concepts clearly. • Group Discussions: Organizing group discussions to stimulate critical thinking and exchange of ideas among students. • Organizing field visits to oil refineries to familiarize students with the practical environment. • Providing constructive feedback to improve performance. • Providing digital study materials to provide easy access to information. • Promoting awareness of the importance of safety in the work environment.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	At the end of this learning unit, the student is able to : **13.** Explain the different processes of oil refining such as distillation, chemical separation, and hydrotreatment. **14.** Identify the different stages in the refining process and the devices used in it. **15.** Using modern technologies in refining operations and analyzing their results. **16.** Analyze problems related to oil refining using critical thinking skills. **17.** Proposing effective solutions to operational and technical problems in refineries. **18.** Apply	Conversion Processes Visbreaking	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
2	3		Coking, Fluid Catalytic Cracking	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
3	3		Hydrotreating and Hydrocracking	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
4	3		Upgrading Naphtha Catalytic Reforming	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
5	3		Isomerization	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams

6	3	occupational safety and health procedures in the refining environment. **19.** Identify potential risks and how to deal with them to reduce accidents. **20.** Keeping up with the latest technological developments in the field of oil refining. **21.** Applying modern technology to improve process efficiency and reduce costs. **22.** Contributing to research and development to develop new technologies and methods in oil refining. **23.** Providing new ideas to improve operations and increase their efficiency. **24.** Analysis of costs and returns associated with refining operations. Understand the financial challenges facing the refining industry and how to overcome them. 13.Understand the	Product Blending	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
7	3		Reid Vapor Pressure, Octane Blending. Supporting Processes Hydrogen Production	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
8	3		Mid Examination	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
9	3		Gas Processing Unit	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
10	3		Acid Gas Removal	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
11	3		Sulfur Recovery Processes	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams

12	3	financial challenges facing the refining industry and how to overcome them.	Chemical Treatment of Petroleum Products	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
13	3		Oil Products	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
14	3		Lubricating Oils	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams
15	3		Safety and Environmental Aspects in Refining	using the blackboard And Datashow+ Discussion	Daily exams And homework In addition to Monthly exams

11.Cours Evaluation

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

12. Learning and Teaching Resources

- **W.L. Nelson, Petroleum Refinery Engineering, 1991, MacGraw Hill.**
- **S. Parkash, Refining Processes Handbook, 2003, Elsevier / GPP.**
- **Fahim, Mohamed A., Taher A. Al-Sahhaf, and AmalElkilani. Fundamentals of petroleum refining. Elsevier, 2009.**
- **G.D. Hobson:, Modern Petroleum technology, 1991, Applied Sc. Publisher**
- **J.H. Cary and G.E Handwork,Petroleum Refinery Technology & Economics , ,2001Dekker**
- **Oil and Gas Journal**

Course Description Form

1. Course Name:	
Reactor Design	
2. Course Code:	
ChE202	
3. Semester / Year:	
Course I 2024	
4. Description Preparation Date:	
2024	
5. Available Attendance Forms:	
6. Number of Credit Hours (Total) / Number of Units (Total)	
3 hrs	
7. Course administrator's name (mention all, if more than one name)	
Name: Assist Prof Salah N. Farhan **Email: drsalahchem@uodiyala.edu.iq**	
8. Course Objectives	
Course Objectives	a) Establish reaction mechanism b) Collect rate data free of transport limitations. c) Correlate rate data by mathematical equation or otherwise. d) Formulate suitable models for reactor design and select reactor type (i.e. ideal flow pattern). e) Account for nonideality of real reactors and for the effect of physical transport processes. f) Select reactor size and operating conditions. g) Specify key reactor elements. h) Specify auxiliary equipment. i) Specify methods of control. j) Specify start-up and shut-down procedures
9. Teaching and Learning Strategies	
Strategy	Course divide to attendance lectures , tutorials, Exam, Assignments , and reports.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	• Define the rate of chemical reactions • Apply the mole balance equations to batch reactors, CSTRs, PFRs, and PBRs • Describe two industrial reaction engineering systems • Describe photos of real reactors.	**Mole Balances**	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
2,3	6	• Calculate the equilibrium conversion for both gas and liquid phase reactions • Write the combined mole balance and rate law in measures other than conversion • Set up a stoichiometric table for reactions with phase change	**Conversion and Reactor Sizing,** Stoichiometry of Gas Phase Reactions Stoichiometry - Gas Phase Batch CSTR	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.

4	3	• Apply CRE algorithm to gas phase • Account for the effects of pressure drop conversion in packed bed tubular reactors and in packed bed spherical reactors Answer what if... questions	Gas Phase Reactions with Pressure Drop Objectives	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
5	3	• Write balance equations in measure other than conversion and apply these balance evaluations to membrane reactors and semibatch reactors	Measures Other Than Conversion, Membrane Reactors and Semibatch Reactors Objectives	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
6		• Determine the reaction order and specific reaction rate from experimental data obtained for either batch or flow reactors • Describe how to use equal-area differentiatio	Analysis of Data	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.

		n, polynomial fitting, numerical difference formulas and regression to analyze experimental data to determine the rate law			
7	3	• Define different types of selectivity and yield • Choose a reaction system that would maximize the selectivity of the desired product given the rate laws for all reactions occurring in the system	Selectivity and Relative Rates of Reaction	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
8	3	• Write net rates of reaction for each species present • Write the combined mole balance, rate law and stoichiometry for multiple	Algorithms for Multiple Reactions	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.

		reactions		students are made to participate in the lecture.	
9,10	6	• Discuss each term in the energy balance • Describe the algorithm for CSTRs that are not operated isothermally Size adiabatic and nonadiabatic CSTRs	Energy Balance and Adiabatic Operation	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
11	3	• Discuss reactor staging for adiabatic reaction Discuss optimum impact temperatures	Energy Balance and Its Application to the CSTR	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
12	3	• Describe the algorithm for PFRs and PBRs with heat exchange Size adiabatic and nonadiabatic PFRs and PBRs	Derivation Energy Balance and Its Application to a PFR	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.

				• Oral and power point presentations by the students are made to participate in the lecture.	
13	3	• Carry out an analysis to determine the Multiple Steady States (MSS) in a CSTR along with the ignition and extinction temperatures	Multiple Steady States	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
14	3	• Analyze multiple reactions carried out in CSTRs, PFRs and PBRs which are not operated isothermally in order to determine the concentrations and temperature as a function of position (PFR/PBR) and operating variables.	Multiple Reactions with Heat Effects	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.

15	3	• Analyze batch reactors and semibatch not operated isothermally • Analyze the startup of nonisothermal CSTRs • Analyze multiple reactions in batch and semibatch reactors not operated isothermally	Unsteady State Nonisothermal Reactor Design	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.
16	3	• Define a catalyst, a catalytic mechanism and a rate limiting step • Describe the steps in a catalytic mechanism and how one goes about deriving a rate law and a mechanism and rate limiting step consistent with the experimental data	Catalysis	• Lecture plan and in-class activities. • Each class will commence with a summary of the previous lecture. • Questions will be asked and the responses will be used to evaluate the students' understanding of the topics covered. • Oral and power point presentations by the students are made to participate in the lecture.	In-class questions and discussion. • Quizzes. • Homework and assignments. • Seminars. • Oral and ppt. presentations.

11.Cours Evaluation

1. Quizzes: - There will be (4) closed books and notes quizzes during the semester. - The quizzes will count 7% of the total module grade.
2. Mid-Term Test, 1 Nos. and will count 10% of the total module grade.
3. Homework and assignments, and will count 7% of the total module grade.
4. Seminars and oral & ppt. presentations, and will count 6% of the total module grade.
5. Extracurricular Activities, this is optional and will count extra marks (1–5%) for the student, depending on the type of activity.
6. Final Exam: - The final exam will be comprehensive, closed books and notes, and will take place on (Saturday-6 th - January / 20) from 9:00 AM - 12:00 PM in rooms ( ) - The final exam will count 70% of the total module grade

12. Learning and Teaching Resources

1- Fogler, H.S. , "Element of chemical Reaction Engineering" Prentic Hall (2000).

2- Levespiel,O., "Chemical Reaction Engineering" Wiley&Sons (1999).

3- Smith,J.M.," Chemical Engineering Kinetics" 3rd ed., McGraw Hill (1981).

4-Ronald W. Missen et al., (1999), "Introduction to chemical reaction engineering and kinetics",