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

Academic Program and Course Description Guide

2024

Academic Program Description Form

University Name: .....Al- Nahrain university..

Faculty/Institute: .....Science....

Scientific Department: .....Chemistry.....

Academic or Professional Program Name: ..... Bachelor....

Final Certificate Name: ....Bachelor in chemistry.....

Academic System: ...Semester.....

Description Preparation Date: 2024/3/1

File Completion Date: 2024/3/1

Signature:

Head of Department Name:

Dr. Taghried Ali Salman

Date: 14/4/2024

Signature:

Scientific Associate Name:

Manaf Adnan Saleh

Date: 14/4/2024

The file is checked by: Dr. Oroobba Nadhim Harbi

Department of Quality Assurance and University Performance

Director of the Quality Assurance and University Performance Department:

Date: 14-4-2024

Signature:

Approval of the Dean

1. Program Vision

The Chemistry Department, College of Science seeks to achieve a prominent position at the research and teaching levels, by creating a distinctive scientific environment and developing educational curricula for graduate and post graduate studies. In addition, focusing on scientific research and publication in peer-reviewed international journals. The department also aims to motivate the faculty to excel in spreading science and knowledge, and to qualify distinctive graduates who can meet the needs of society at a high level.

2. Program Mission

The mission of Chemistry Department is to achieve excellence in the field of science of chemistry through its commitment to higher education, scientific research, and service to society. The department aims to graduate a new generation of distinguished graduates, who possess the scientific knowledge and practical skills necessary to achieve excellence in multiple fields. The department seeks to develop innovative educational programs that reflect the latest developments in chemistry and encourage critical thinking and innovation. The department also seeks to conduct high-quality scientific research that contributes to expanding knowledge and its practical applications in the fields of industry, environment and medicine. In addition, the department seeks to serve the community by providing consultation, training, and awareness of the importance of chemistry in daily life and its impact on health and the environment.

3. Program Objectives

The objectives of the Chemistry Department program revolve around achieving excellence in the chemistry field by developing knowledge and skills, enhancing critical thinking, stimulating scientific research, developing practical skills, enhancing scientific communication, enhancing environmental and social awareness, and preparing students for professional life.

4. Program Accreditation

No

5. Other external influences

1- Economic, health, and social conditions that influence the academic program. For example, economic conditions can affect the availability of funding for academic programs, or a medical situation such as the Corona pandemic can affect students' performance and access to University.

2- The development of technology and its use in academic programs can have a significant impact. Such as the use of technology in distance education or providing educational resources online can change the student experience and affect how knowledge is presented and acquired.

3- International relations can influence study programs significantly, especially in areas such as student exchange and academic cooperation between Universities in different countries.

6. Program Structure

Program Structure	Number of Courses	Credit hours	Percentage	Reviews*
Institution Requirements	14	20	12.5%	The department currently adopts the Bologna curriculum for the first stage, the unified ministerial program for the second stage, and the basic University system for the remaining stages
College Requirements	6	21	13.2%	
Department Requirements	36	118	74.2%	
Summer Training	Yes	–	–	
Other	–	–	–	

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

7. Program Description

Year/Level	Course Code	Course Name	Credit Hours	
			theoretical	practical
First year/First semester	CHEM1102	Atomic structure and quantum theory	3	0
	CHEM1101	Chemistry of qualitative analysis	5	2
	CREQ1101	Calculus I	4	0
	CREQ1109	General Physics 1	2	2
	URENG	English	2	0
	URCOM	Introduction to computer science	2	2
First year/Second semester	CHEM1207	Chemistry of volumetric analysis	5	2
	CREQ1207	Occupational safety	4	0
	CREQ1201	Calculus 2	3	0
	URDEM	Democracy and human rights	2	0
	URARA	Arabic	2	0
	CHEM1208	Theories of covalent bonds	3	2
Second year/First semester	CHEM 211	Inorganic chemistry	2	2
	CHEM 221	Analytical chemistry	2	2
	CHEM 231	Organic chemistry	2	2
	CHEM 241	Physical chemistry	2	2
	CHEM 251	Biochemistry	2	–
	BIOT 281	Safety	3	–
	UREQ201	Arabic	1	–
	UREQ 210	English	1	–
	CHEM 212	Inorganic chemistry	2	2
Second year/ Second semester	CHEM 222	Analytical chemistry	2	2
	CHEM 232	Organic chemistry	2	–
	CHEM 242	Physical chemistry	2	2
	CHEM 252	Biochemistry	2	2
	UREQ 245	Mathematics	3	–
	UREQ202	Arabic	1	–
	UREQ 220	English	1	–

Third year/First semester	CHEM 311	Inorganic chemistry	3	–
	CHEM 321	Analytical chemistry	2	–
	CHEM 331	Organic chemistry	2	–
	CHEM 341	Physical chemistry	2	2
	CHEM 351	Biochemistry	2	2
	CHEM 371	Radiation	2	–
	UREQ 320	Human rights	1	–
	UREQ 310	English	1	–
Third year/Second semester	CHEM 312	Inorganic chemistry	3	–
	CHEM322	Analytical chemistry	2	–
	CHEM 332	Organic chemistry	2	2
	CHEM 342	Physical chemistry	2	2
	CHEM 352	Biochemistry	2	–
	CHEM 362	Radiation	2	2
	CHEM 302	Pollution	2	–
	UREQ 320	Democracy	1	–
	UREQ 320	English	1	–
Fourth year/First semester	CHEM 421	Instrumental analysis	3	2
	CHEM 431	Identification	2	4
	CHEM 441	Physical chemistry	2	2
	CHEM 451	Biochemistry	2	2
	GEOL491	Geology	2	–
	UREQ 410	English	1	–
	CHEM 481	Research project	–	4
Fourth year/Second semester	CHEM422	Instrumental analysis	2	2
	CHEM 442	Quantum	2	–
	CHEM 412	Inorganic chemistry	2	2
	CHEM 462	Industrial chemistry	2	2
	CHEM 490–499	Elective	2	–
	UREQ 420	English	1	–
	CHEM 482	Research project	–	4

8. Expected learning outcomes of the program

Knowledge	
–Enabling students to obtain knowledge and understanding of the intellectual framework in chemical sciences –Enabling students to obtain knowledge and understanding of the various standards in chemistry –Enabling students to obtain knowledge and understanding of chemical analysis and examination –Enabling students to obtain knowledge and understanding of the warnings of incorrect use of chemical materials –Enabling students to obtain knowledge and understanding of chemical systems and technologies and their applications –Enabling students to obtain knowledge and understanding of modern chemical technologies	– Providing students with the basics and topics related to knowledge and systems described in: A – Clarification and explanation of study materials by the academic staff through available modern capabilities B – Providing students with knowledge through classroom and extracurricular vocabulary assignments C – Asking students to visit the library to obtain academic knowledge related to academic vocabulary D – Improving students' skills by visiting websites to obtain additional knowledge of the subjects Scholarship
Skills	
1–Enabling students to think and analyze topics related to the intellectual framework and standards of international chemical sciences	Providing students with the basics and additional topics related to the outcomes of chemical thinking and analysis – Forming discussion groups during lectures to discuss topics in chemistry that require thinking And analysis
2–Enabling students to think and analyze topics related to chemistry 3– Enabling students to think and analyze topics related to systems and punishment of abusers using substances Hazardous chemicals.	– Asking students to solve a set of thinking questions during lectures, such as what, how, when and why For specific topics

	Giving students classwork and extracurricular assignments that require self-explanation
Ethics	
1. Students learn the value of continued research and exploration in the field of chemistry, and are encouraged to have a dedication to understanding chemical phenomena and contributing to the advancement of scientific knowledge. 2. Students learn to use chemical knowledge in a way that promotes public health and sustainability. 3. The values of scientific integrity and ethics are promoted among students, with an emphasis on the importance of working safely and adhering to ethical standards in scientific experiments and research. 4. Students are encouraged to collaborate with colleagues in scientific research and experiments, which enhances teamwork skills and the ability to communicate effectively. 5. The value of diversity and respect for others is promoted in the learning environment, with an emphasis on the importance of appreciating and understanding diversity in scientific backgrounds, cultures and opinions.	Teach students to gain a comprehensive understanding of basic and advanced concepts in chemistry, including atoms and molecules, chemical reactions, physical states, and more. Teach students the ability to critically analyze chemical information and apply rationality and critical thinking to solving chemical problems. Teach students to gain hands-on laboratory experience by conducting hands-on experiments, analyzing data, and learning about laboratory tools and techniques. Teach students how to effectively express chemical ideas and concepts, whether through writing or oral explanation. Teach students to be able to apply chemical concepts in real-life contexts such as industry, medicine, and environmental protection.

6. Students are encouraged to strive for excellence in chemistry through innovation and creative thinking, while being motivated to apply chemical concepts to solve real problems.	Teach students the ability to develop new and creative solutions to complicated chemical problems.

9. Teaching and Learning Strategies

1. Cooperative Learning: Encourage students to work in small groups to solve chemical problems and conduct experiments. This strategy can contribute to enhancing communication and collaboration skills among students, in addition to stimulating critical thinking and the exchange of ideas.

2. Project-based learning: Provide comprehensive chemistry projects for students to complete, such as conducting a research experiment or developing a chemical product. This strategy encourages creative thinking and practical application of chemical concepts.

3. Problem-based learning: Present complex chemistry problems that students must solve using the concepts and skills learned. This strategy enhances skills and critical thinking in real chemistry contexts.

4. Experiential learning: Conduct practical experiments in laboratories to enhance effective interaction with chemical concepts. This strategy can be used to enhance practical skills and a deep understanding of chemical topics.

5. Active learning: Encourage students to participate in active activities such as discussions, presentations and workshops. This strategy can enhance critical thinking and scientific communication.

6. Use of technology: Adopting technology in learning, such as using interactive chemical software, computer simulations of experiments, and online educational resources. This strategy helps promote engagement and stimulate interest in the material.

10. Evaluation methods

- Daily and semester tests with multiple-choice questions and intellectual questions for the academic subject
- Setting grades for students' participation in difficult competitive questions
- Establishing grades for assigned class and extracurricular assignments.

11. Faculty

Faculty Members

Academic Rank	Specialization		Special Requirements/Skills (if applicable)	Number of the teaching staff	
	General	Special		Staff	Lecturer
Professor	Chemistry	Organic	Ability to communicate organic chemistry concepts in effective and appropriate ways to students	4	
Professor	Chemistry	Inorganic	Ability to communicate inorganic chemistry concepts in effective and appropriate ways to students	1	
Professor	Chemistry	Physical	Ability to communicate physical chemistry concepts in effective and appropriate ways to students	1	
Professor	Chemistry	Analytical	Ability to communicate analytical chemistry concepts in effective and appropriate ways to students	2	

Professor	Chemistry	Bio	Ability to communicate Bio chemistry concepts in effective and appropriate ways to students	2	
Assistance prof	Chemistry	Organic	Ability to communicate organic chemistry concepts in effective and appropriate ways to students	2	
Assistance prof	Chemistry	Inorganic	Ability to communicate inorganic chemistry concepts in effective and appropriate ways to students	4	
Assistance prof	Chemistry	Physical	Ability to communicate physical chemistry concepts in effective and appropriate ways to students	3	
Assistance prof	Chemistry	Analytical	Ability to communicate analytical chemistry concepts in effective and appropriate ways to students	5	
Assistance prof	Chemistry	Industrial	Ability to communicate industrial chemistry concepts in effective and appropriate ways to students	2	
Assistance prof	Chemistry	Bio	Ability to communicate Bio chemistry concepts in effective and appropriate ways to students	2	

Assistance prof	Chemical engineering	Catalysts	Ability to communicate Catalysts chemistry concepts in effective and appropriate ways to students		1	
Assistance prof	Biology	Environment	Ability to communicate Environment chemistry concepts in effective and appropriate ways to students		1	
Lecturer	Chemistry	Organic			2	
Lecturer	Chemistry	Inorganic			3	
Lecturer	Chemistry	Physical			1	
Lecturer	Chemistry	Analytical			3	
Lecturer	Chemistry	Industrial			1	
Lecturer	Chemistry	Bio			1	
Assistance lecturer	Chemistry	Organic				
Assistance lecturer	Chemistry	Inorganic				
Assistance lecturer	Chemistry	Physical				
Assistance lecturer	Chemistry	Analytical				
Assistance lecturer	Chemistry	Industrial				

Professional Development

Mentoring new faculty members

Professional development of faculty members

Analyzed the needs of faculty members through opinion surveys, workshops, student performance evaluations, and analysis of academic data to identify areas in need of development.

Based on specific needs, customized training programs are designed that include the use of modern teaching strategies, assessment techniques, and personal professional development. Training programs are implemented by professional trainers, whether inside or outside the university, with opportunities for workshops and group discussions to exchange experiences.

- Members' application of acquired skills and concepts is monitored through periodic evaluations, including performance reviews and student evaluations, providing an opportunity to modify training programs based on actual needs.
- Faculty members are encouraged to participate in ongoing professional development activities such as attending conferences, academic publishing, and participating in advanced training programs.

12. Acceptance Criterion

(Developing regulations related to admission to the college or institute, whether central admission or others mentioned)

(Central admission - scientific)

According to the requirements of the Ministry of Higher Education and Scientific Research, so that it matches the latest admission requirements in Iraqi Universities

(Parallel acceptance - scientific)

Acceptance of evening study - scientific

Accept a scholarship

13. The most important sources of information about the program

- University requirements
- Local scientific trends
- Global scientific requirements
- Covering the specialized staff locally

14. Program Development Plan

- Defining the educational objectives of the program (such as enhancing students' understanding of basic chemical concepts, developing practical experimental skills, promoting scientific research in specific areas).
- Determine the academic subjects and concepts that students will learn.
- Identifying appropriate educational methods such as traditional lectures, applied activities, practical experiments, and interactive online lessons.
- Identifying evaluative tools to measure the achievement of educational objectives.
- Developing curricula and courses.
- Creating additional educational materials such as textbooks, practical papers, multimedia resources (such as educational videos, presentations, etc.).
- Training teachers on the new curricula and educational methods used in the program.
- Providing ongoing courses, workshops, seminars and discussions to improve and develop teaching skills.
- Periodically evaluate the program to measure its effectiveness in achieving educational objectives.
- Collect student and teacher feedback to identify strengths, weaknesses, and areas that can be improved.
- Use evaluation results to improve and adapt the program to student needs and industry aspirations.
- Updating educational materials and educational methods based on previous experiences and new directives in the field of chemical sciences.

Program Skills Outline														
				Required program Learning outcomes										
Year/Level	Course Code	Course Name	Basic or optional	Knowledge				Skills				Ethics			
				A1	A2	A3	A4	B1	B2	B3	B4	C1	C2	C3	C4
First year/First semester	CHEM1102	Atomic structure and quantum theory	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM1101	Chemistry of qualitative analysis	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CREQ1101	Calculus I	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CREQ1109	General Physics 1	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	URENG	English	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	URCOM	Introduction to computer science	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Second year/ Second semester	CHEM1207	Chemistry of volumetric analysis	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CREQ1207	Occupational safety	Basic	√	√	√	√	√	√	√	√	√	√	√	√

	CREQ1201	Calculus 2	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	URDEM	Democracy and human rights	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	URARA	Arabic	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM1208	Theories of covalent bonds	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Second year/First semester	CHEM 211	Inorganic chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 221	Analytical chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 231	Organic chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 241	Physical chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 251	Biochemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	BIOT 281	Safety	Basic	√	√	√	√	√	√	√	√	√	√	√	√

	UREQ201	Arabic	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	UREQ 210	English	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 212	Inorganic chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Second year/ Second semester	CHEM 222	Analytical chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 232	Organic chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 242	Physical chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 252	Biochemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	UREQ 245	Mathematics	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	UREQ202	Arabic	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	UREQ 220	English	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third year/First semester	CHEM 311	Inorganic chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√

	CHEM 321	Analytical chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 331	Organic chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 341	Physical chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 351	Biochemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 371	Radiation	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	UREQ 320	Human rights	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	UREQ 310	English	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Third year/Second semester	CHEM 312	Inorganic chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM322	Analytical chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√

	CHEM 332	Organic chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 342	Physical chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 352	Biochemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 362	Radiation	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 302	Pollution	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	UREQ 320	Democracy	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	UREQ 320	English	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth year/First semester	CHEM 421	Instrumental analysis	Basic	√	√	√	√	√	√	√	√	√	√	√	√

	CHEM 431	Identification	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 441	Physical chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 451	Biochemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	GEOL491	Geology	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	UREQ 410	English	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 481	Research project	Basic	√	√	√	√	√	√	√	√	√	√	√	√
Fourth year/Second semester	CHEM422	Instrumental analysis	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 442	Quantum	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 412	Inorganic chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√

	CHEM 462	Industrial chemistry	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 490−499	Elective	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	UREQ 420	English	Basic	√	√	√	√	√	√	√	√	√	√	√	√
	CHEM 482	Research project	Basic	√	√	√	√	√	√	√	√	√	√	√	√
				√	√	√	√	√	√	√	√	√	√	√	√

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

Course Description Form

1. Course Name: Inorganic chemistry

2. Course Code: **Inorganic chemistry- 211**

3. Semester / Year: first -2024

4. Description Preparation Date:32-3-2024

5. Available Attendance Forms: 2hr

6. Number of Credit Hours (Total) / Number of Units (Total):45hrs

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

Name: Dina Adil Najeeb
Email: dinachem70@gmail.com

8. Course Objectives

Course Objectives	**….. 1- Introducing students to the main basic concept related to descriptive inorganic compounds Formation** **….. Focusing on the chemical and physical property of some group and how they are prepare**

9. Teaching and Learning Strategies

Strategy	**1-Introduce students to the basic concepts of some property group elements.** **2- introduce to the property of compounds and its reactivity**

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Group(V) A elements	- General properties b- Electronic structure and oxidation states	Explanation of the article and Use of illustrat	Short oral and written exams
2	2	Group(V) A elements	- Nitrogen: c.1- Occurrence and properties c.2- Preparation and uses of elemental nitrogen	Explanation of the article and Use of illustrations	Short oral and written exams
3	2	Group(V) A elements	- Covalent compounds of nitrogen ; preparation , properties and uses. Compound of oxide. States -3,-2,-1,+1,+2,+3,+5 c.4- Ionic compounds of nitrogen	Explanation of the article and Use of illustrations	Short oral and written exams
4	2	Group(V) A elements	Photochemical Smog d-Phosphorus d.1- Occurrence and properties d.2- The free element d.3- Compounds of phosphorus	Explanation of the article and Use of illustrations	Short oral and written exams
5	2	Group(V) A elements	Oxides of phosphorus - Phosphoric acid and phosphates - Polymeric phosphoric acids and their anions - Phosphorus acid	Explanation of the article and Use of illustrations	Short oral written exam
6	2		Mid Exam	6	2

7	2	**- Group III elements**	**- General properties b- Electronic structure and oxidation state c- Oxygen c.1- Preparation and uses c.2- Ozone**	**Explanation of the article and Use of illustrations**	**Short oral and written exams**
8	2		**Compounds of oxygen - Ionic oxides - Covalent oxides - Peroxides and superoxides**	**Explanation of the article and Use of illustrations**	**Short oral and written exams**
9	2		**Sulfur d.1- Occurrence and properties - The free element d.3- Compounds of sulfur - Sulfur dioxide and sulfurous acid - Sulfur trioxide and sulfuric acid**	**Explanation of the article and Use of illustrations**	**Short oral and written exams**
10	2		**Acid rain - Other compounds of sulfur e- Selenium, Tellurium and Polonium e.1- Properties e.2- Compounds and uses**	**Explanation of the article and Use of illustrations**	**Short oral and written exams**
11	2		**Occurrence of halogens b- Properties of the free elements c- Preparation of the free elements**	**Explanation of the article and Use of illustrations**	**Short oral and written exams**
12	2		**Compounds of the halogen d.1- Binary halides of metals d.2- Hydrogen halides d.3- Oxoacids and oxoanions e- Other halogen compounds of the nonmetals**	**Explanation of the article and Use of illustrations**	**Short oral and written exams**

13	2	**Group III elements**	**Electronic structure and properties b- Preparation and properties of Xenon compounds**	**Explanation of the article and Use of illustrations**	**Short oral and written exams**
14	2	**Group III elements**	**Mid exam**	**Explanation of the article and Use of illustrations**	**Short oral and written exams**

11. Course Evaluation

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	**- Inorganic Chemistry James E. House**
Main references (sources)	Catherine E. Housecroft and Alan G. Sharpe
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	Web site at www.books.elsevier.com

1 Course Name: Inorganic Chemistry	
2 Course Code: Inorganic chemistry- 211	
3 Semester / Year:second	
4 Description Preparation Date:23-3-2024	
5 Available Attendance Forms: 2hrs	
6 Number of Credit Hours (Total) / Number of Units (Total) 45 hours	
7 Course administrator's name (mention all, if more than one name)	
Name: Dina Adil Email: dinachem70@gmail.com	
8 Course Objectives	
Course Objectives	**- Introducing students to the main basic concepts related to descriptive inorganic compounds Formation.** **Focusing on the chemical and physical property of some group and how they are prepare** • **definition some principle of inorga chemistry**….. • ….. • …..
9 Teaching and Learning Strategies	
Strategy	**A1. Introduce students to the basic concepts of some property group elements.** **A2. introduce to the property of compounds and its reactivity**

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hour	Symmetry group theory	-Symmetry operations and symmetry elements - Identity	Explanation of the article and Use illustrations	Short oral and wr exams
2	2 hour		Center of symmetry - Rotational axis - Mirror plane -Improper rotational axis	Explanation of the article and Use of illustrations	Short oral and wr exams
3	2 hour		Point groups - Applications	Explanation of the article and Use of illustrations	Short oral and wr exams
4	2 hour	Radioactivity and nuclear chemistry	Natural radioactivity -Disintegration of radioactive elements -Rate of disintegration and half-life	Explanation of the article and Use of illustrations	Short oral and wr exams
5	2 hour		Artifical radioactivity - Nuclear reactions - Energetic of nuclear reactions	Explanation of the article and Use of illustrations	Short oral and wr exams
6	2 hour		Mid Exam	6	2 hour
7	2 hour		Types of nuclear reactions - Induction of nuclear reaction - By charged particles - By neutrons	Explanation of the article and Use of illustrations	Short oral and wr exams
8	2 hour		Nuclear fission - Nuclear fusion -Synthetic elements	Explanation of the article and Use of illustrations	Short oral and wr exams
9	2 hour	Acid - base Chemistry	Acid - base Concepts: a- Bronsted - Lowery definition b- Lux - Flood definition	Explanation of the article and Use of illustrations	Short oral and wr exams

10	2 hour		Solvent system definition d- Lewis definition e- A generalized acid - base concept :	Explanation of the article and Use of illustrations	Short oral and wr exams
11	2 hour		Acidity of oxy acids 3- Basically of metal oxides 4- Hydration and hydrolysis reactions	Explanation of the article and Use of illustrations	Short oral and wr exams
12	2 hour		Basicity of substituted amines f- Hard and soft acid , and bases	Explanation of the article and Use of illustrations	Short oral and wr exams
13	2 hour		classification of acids and bases as hard or soft 2- Electronegtivity and hardness and softness .	Explanation of the article and Use of illustrations	Short oral and wr exams
14	2 hour		Mid exam	14	2 hour

11 Course Evaluation

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

12 Learning and Teaching Resources

Required textbooks (curricular books, if any)	**1- Inorganic Chemistry James E. House**
Main references (sources)	Catherine E. Housecroft and Alan G. Sharpe
Recommended books and references (scientific journals, reports…)	
Electronic References, Websites	Web site at www.books.elsevier.com

Course Description Form

1	Course Name: Inorganic Chemistry
2	Course Code: CHEM 311
3	Semester / Year: First sem. 2023-2024
4	Description Preparation Date:2023-2024
5	Available Attendance Forms: attending
6	Number of Credit Hours (Total) / Number of Units (Total): 3 hours for each sem.
7	Course administrator's name (mention all, if more than one name)
	Name: Assistant. Professor. Farah Muaiad Ibrahim, Dr. Ammar Jehad Sac Email: farah.muaiad@nahrainuniv.edu.iq
8	Course Objectives

Course Objectives	• **Introduction to Coordinate Chemistry includ** • **Define the transition elements and chem properties of transition elements as well as t different oxidation states. And know electronic arrangement of transitional eleme describe the redox chemistry of some transi elements and the preparation of some transi metal compounds,** • **Define the concept of coordinate compou with examples and geometric shapes complexes and types of ligands used in preparation of complexes.** • **What are the most important theories t explain the formation of complexes and wha the most accepted theory and includes?** • **First: Chain Theory** • **Second: Werner's theory.** • **B- Complex writing method and rules naming coordinate compounds** • **and the interactions, uses preparation a presence of transition elements.** • **Introduction to the isomers of transi elements. Know the types of isomers w examples.**

9 Teaching and Learning Strategies

Strategy	1. The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students. 2. Ask students a range of thinking questions during lectures, such as what, how, when and why. 3. Give the students some duties that require subjective interpretations.

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1		norganic hemistry	detailed explanation the course material r the first semester and then an	attending	nthly exams and quizzes

			introduction to transition metals		
2		horganic hemistry	Transition elements and chemical pperties of transition elements as well as eir various oxidation states		
3		horganic hemistry	Know the electronic arrangement of the ransitional elements and the most nportant compounds of the transitional elements		
4		horganic hemistry	Redox chemistry of some transition elements and reparation of some transition metal compounds		
5		horganic hemistry	Definition of the concept of coordination compounds with examples		
6		horganic hemistry	Know the types of ligands used to prepare complexes.		
7		horganic hemistry	Mid1-term Exam the		
8		horganic hemistry	Naming the coordination compounds		
9		horganic hemistry	Structures of metal complexes		
10		horganic hemistry	Series theory and Werner's theory.		
11		horganic hemistry	Application of Werner's theory		
12		horganic hemistry	Mid2-term Exam		
13		horganic hemistry	()Introduction to isomers of coordination compounds.		
14		horganic hemistry	classification of mers with examples		
15		horganic hemistry	Preparatory week before the final exam		
11 Course Evaluation					

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc Quizzes (week5,10) 10% (10) Assignments (week4,14) 10% (10) Projects / Lab. no Report: The report is in week 13 and the daily preparation and participation are followed daily) 10% (10) Midterm Exam(week7,12) 2 hr. 10% (10) Final Exam 3hr (week 16) 60% (60)

12 Learning and Teaching Resources

Required textbooks (curricular books any)	
Main references (sources)	oduction to Inorganic Chemistry (Wikibook),2024, Penn te University rganic chemistry. Fifth edition Gary L. Miessler, Paul J. her, Donald A. Tarr, Pearson Education, Inc
Recommended books and references (scientific journals, reports…)	rdination chemistry, Fred Basolo, Ronald C. Johnson, ond edition
Electronic References, Websites	s://byjus.com/jee/coordination-compounds s://scienceinfo.com/transition-metals s://www.studysmarter.co.uk/explanations/chemistry/in anic-chemistry/transition-metals/

Course Description Form

1. Course Name: Inorganic Chemistry
2. Course Code: CHEM 312
3. Semester / Year: second sem. 2023-2024
4. Description Preparation Date:2023-2024
5. Available Attendance Forms: attending
6. Number of Credit Hours (Total) / Number of Units (Total): 3 hours for each sem.
7. Course administrator's name (mention all, if more than one name)
Name: Assistant. Professor. Farah Muaiad Ibrahim, Dr. Ammar Jehad Sac Email: farah.muaiad@nahrainuniv.edu.iq
8. Course Objectives

Course Objectives	**Introduce students to the basic concepts of synergistic theories of coordinate compounds** **Give the student an accurate description of the theories of contemporaneity** **Valence bond theory, magnetic measurements ar number of individual electrons for complexes of geometric shapes: tetrahedral plane, octahedral a plane square, internal orbital complexes and external orbital complexes.** **– Crystal field theory, measurement of crystal fi energy in the case of a strong and weak field, knowledge of electron duplex energy and quadru deformation in octahedral complexes (Jeanne: Teller deformation) and interpretation of the colo of complexes** **– Orbital molecular theory of σ in octahedral complexes, molecular orbital diagram (MOT) for**

	hexagonal complexes, energy level diagram of complex containing pi−π bonds and diagrams method **And describe thermodynamic stability and mot**

9. Teaching and Learning Strategies

Strategy	1. The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering types of simple experiments involving some sampling activities that are interesting to the students. 2. Ask students a range of thinking questions during lectures, such as what, how, when and why. 3. Give the students some duties that require subjective interpretations.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Inorganic chemistry	Introduce students to t basic concepts of theories for coordinatic compounds	attending	monthly exams ar quizzes
2	3	Inorganic chemistry	Give the student an accurate description o the VBT theory with examples		
3	3	Inorganic chemistry	Complementing the Theory of VBT and th Concept of inner Orbi Complexes and outer Orbital Complexes		

4	3	Inorganic chemistry	Magnetic properties of complexes with geometric shapes: tetrahedral, octahedral and square planar		
5	3	Inorganic chemistry	Crystal field theory an measurement of the amount of energy of splitting of the crystalline field in the case of a strong and weak field		
6	3	Inorganic chemistry	describe the types of strong and weak ligands and their role in determining the energy splitting		
7	3	Inorganic chemistry	Mid1-term Exam the		
8	3	Inorganic chemistry	Interpretation of the colours of complexes		
9	3	Inorganic chemistry	The energy of splitting and deformation in octahedral complexes (Jhan Teller) Scientific activities		
10	3	Inorganic chemistry	Orbital molecular bonding σ in octahedra complexes and molecular orbital diagram		
11	3	Inorganic chemistry	Applications of octahedral molecular diagram		
12	3	Inorganic chemistry	Mid2-term Exam		
13	3	Inorganic chemistry	describe the energy leve diagram of an octahedra complex containing pi π bonds and the molecula orbital diagram		
14	3	Inorganic chemistry	And describe thermodynamic stability and motor stability and factors affecting the stability		
15	3	Inorganic chemistry	Preparatory week before the final exam		

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc Quizzes (week5,10) 10% (10) Assignments (week4,14) 10% (10) Projects / Lab. no Report: The report is in week 13 and the daily preparation and participation are followed daily) 10% (10) Midterm Exam(week7,12) 2 hr. 10% (10) Final Exam 3hr (week 16) 60% (60)

12. Learning and Teaching Resources

Required textbooks (curricu books, if any)	
Main references (sources)	oduction to Inorganic Chemistry (Wikibook),2024, Penn te University rganic chemistry. Fifth edition Gary L. Miessler, Paul J. her, Donald A. Tarr, Pearson Education, Inc
Recommended books and references (scientific journals, reports…)	rdination chemistry, Fred Basolo, Ronald C. Johnson, ond edition
Electronic References, Websites	s://byjus.com/jee/coordination-compounds s://scienceinfo.com/transition-metals s://www.studysmarter.co.uk/explanations/chemistry/inorg -chemistry/transition-metals/

Course Description Form

1 Course Name: Inorganic Chemistry	
2 Course Code:	
3 Semester / Year: second / 2023-2024	
4 Description Preparation Date:2024-3-23	
5 Available Attendance Forms:	
6 Number of Credit Hours (Total) / Number of Units (Total)	
2 Theoretical +2 practical / 3	
7 Course administrator's name (mention all, if more than one name)	
Name: Hanan Abdoulatief Ibrahiem Email: hanan.ibrahiem@nahrainuniv.edu.iq	
8 Course Objectives	
Course Objectives	• **The students learn color transition metals comple and the reasons aperances** • **The students learn concept of term symbol a learn how calculate it** • **Study the mechanisum inorganic reactions and a to distinguish between th** • **Know the nephelaux effect and the facto effecting of it**
9 Teaching and Learning Strategies	
Strategy	Theoretical lectures and practical study

10 Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
first	2	Color of Transiti Metal Complexes	Inorganic Chemistry	Explanation	Exam
second	2	Term symbol	Inorganic Chemistry	Explanation	Exam
thierd	2	Ligand Substitution	Inorganic Chemistry	Explanation	Exam
fourth	2	Types of Substitution Mechanisms	Inorganic Chemistry	Explanation	Exam
fifth	2	Substitution Square Plar Complexes	Inorganic Chemistry	Explanation	Exam
sixth	2	Trans-Effect	Inorganic Chemistry	Explanation	Exam
seventh	2	Exam 1	Inorganic Chemistry	Explanation	Exam
eightth	2	Substitution a racemization octahedral complexes	Inorganic Chemistry	Explanation	Exam
ninth	2	The Eigen-Wilk mechanism	Inorganic Chemistry	Explanation	Exam
tenth	2	self- exchan reactions	Inorganic Chemistry	Explanation	Exam
eleventh	2	conjugate–base mechanism (Dcb	Inorganic Chemistry	Explanation	Exam

		SN1cb mechanism). Exam 2			
Twelveth	2	Mechanism	Inorganic Chemistry	Explanation	Exam
Thertenth	2	Electron Trans Reactions	Inorganic Chemistry	Explanation	Exam
Fourteenth	2	The Nephelauxe effect	Inorganic Chemistry	Explanation	Exam
fifteenth	2	review	Inorganic Chemistry	Explanation	Exam

11 Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc
70% exam
20%queses
5%class participation
5%presence

12 Learning and Teaching Resources

Required textbooks (curricular books, if any)	Inorganic Chemistry ,Princip of structure and reactivity James E. Huheey
Main references (sources)	1 Mechanisms of Inorganic a Organometallic Reactions M. V. Twigg 2012 2-Inorganic Chemistry CATHERINE E . HOUSECRO AND ALAN G. SHARPE Third Edition
Recommended books and references (scientific journals, reports…)	-

Electronic References, Websites	-

Course Description Form

1 Course Name: Organic	
2 Course Code: CHEM 232	
3 Semester / Year: Semester 2, Year 2	
4 Description Preparation Date: 28/1/2024	
5 Available Attendance Forms: Attendance	
6 Number of Credit Hours (Total) / Number of Units (Total): 3	
7 Course administrator's name (mention all, if more than one name)	
Name: Zahraa Sabah Saeed Email: zahraa.sabah@nahrainuniv.edu.iq	
8 Course Objectives	
Course Objectives	1- Enabling students to acquire knowledge and illusion of organic chemistry 2- Enabling students to acquire knowledge and illusion of the chemical structures of organic compounds 3- Enabling students to acquire knowledge and understanding of reactions in organic chemistry 4- Students acquire knowledge and knowledge of practical experiments in personal chemistry
9 Teaching and Learning Strategies	
Strategy	Lecture method and use of the interactive whiteboard - Explanation and clarification - Providing students with the basics and additional topics related to the outcomes of organic chemical thinking and analysis - Forming discussion groups during lectures to discuss organic chemistry topics that require thinking and analysis - Asking students for a set of thinking questions During lectures, he explains the what, how, when and why of specific topics Giving students homework that requires self-explanation in causal ways.
10 Course Structure	

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	5	Introducing the student to the properties of alkyl halides	alkyl halides	Blackboard and data show	Daily exams and homework
2	5	Introducing the student to methods for preparing alkyl halides	preparing alkyl halides	Blackboard and data show	Daily exams and homework
3	5	Introducing the student to methods for reactions alkyl halides SN2	reactions alkyl halides	Blackboard and data show	Daily exams and homework
4	5	Introducing the student to methods for reactions alkyl halides SN1	reactions alkyl halides	Blackboard and data show	Daily exams and homework
5	5	Introducing the student to the E2 elimination reactions of alkyl halides	elimination reactions of alkyl halides	Blackboard and data show	Daily exams and homework
6	5	Introducing the student to the E2 elimination reactions of alkyl halides	elimination reactions of alkyl halides	Blackboard and data show	Daily exams and homework
7	5	Mid exam	Mid exam	Blackboard and data show	Daily exams and homework
8	5	Introducing the student to alcohols and	Alcohols and their properties	Blackboard and data show	Daily exams and homework

		their characteristics			
9	5	Introducing the student to methods for preparing alcohol	Preparation of alcohol	Blackboard and data show	Daily exams and homework
10	5	Introducing the student to methods for reaction alcohol	Reaction of alcohol	Blackboard and data show	Daily exams and homework
11	5	Introducing the student to the properties of ethers, methods of naming them, and their reactions	Introduction to ethers and their reactions	Blackboard and data show	Daily exams and homework
12	5	Introducing the student to amines and their properties	Amines and their properties	Blackboard and data show	Daily exams and homework
13	5	Introducing the student to the methods of preparing amines	Preparation of amines	Blackboard and data show	Daily exams and homework
14	5	Introducing the student to the reactions of amines	Amine reactions and their detection	Blackboard and data show	Daily exams and homework
15	5	revision	revision	Blackboard and data show	Daily exams and homework

11 Course Evaluation

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

12 Learning and Teaching Resources

Required textbooks (curricular books, if any)	Organic Chemistry - Paula Yurkanis Bruice, 7th Ed, 2014

Main references (sources)	1)Organic chemistry, Morrison and Boyd 2)Organic Chemistry, Clayden J., Creeves N., Warren S and Wother P., Oxford, 2001
Recommended books and references (scientific journals, reports…)	http://www.chemicalprocessing.com/
Electronic References, Websites	http://www.bytoco.com/

Course Description Form

1. Course Name:

Organic chemistry

2. Course Code:

CHEM 431

3. Semester / Year:

Second semester/ 2023−2024

4. Description Preparation Date:

28/1/2024

5. Available Attendance Forms:

Attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

Two hours per week

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

Name: Dr. Mohammed Hussein Ali
Email: mohammed.mashhadani@nahrainuniv.edu.iq

8. Course Objectives

Course Objectives	Enabling students to obtain knowledge and understanding of organic chemistry sciences especially about hetero organic compounds. Enable students to obtain knowledge and understan of chemical tests and examinations and analysis spectra

9. Teaching and Learning Strategies

Strategy	Developing the student's scientific skills and focusing intellectual and analytical skills

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-2	2	Introduction	Introduction	Active learni	Discussion
3-4	2	Classification heterocyclic compoun	Classification heterocyclic compounds	Active learni	Discussion
5-6	2	Nomenclature heterocyclic compoun	Nomenclature heterocyclic compounds	Active learni	Discussion

	2	Structure and aromatic of pyrrole, fur thiophene and pyridine	Structure aromaticity of pyrro furan, thiophene pyridine	Active learnir	Exercise
7-8	2	Methods of synthe properties and chemi reactions of Pyrr Furan, Thiophene Pyridine	Methods of synthe properties chemical reactions Pyrrole, Fur Thiophene Pyridine	Active learnir	Exam
9-11	2	Methods of synthe properties and chemi reactions of Pyrr Furan, Thiophene Pyridine	Methods of synthe properties chemical reactions Pyrrole, Fur Thiophene Pyridine	Active learnir	Homework
12-15	2	Comparison of basic of Pyridine, Piperid and Pyrrole	Comparison basicity of Pyridi Piperidine and Pyrro	Active learnir	Discussion

11. Course Evaluation

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	HETEROCYCLIC COMPOUNDS Co-Coordinator – Dr. Shalini Singh Clayden J. Organic chemistry Organic Chemistry Pa Yurkanis Bruice
Main references (sources)	HETEROCYCLIC COMPOUNDS Co-Coordinator – Dr. Shalini Singh Clayden J. Organic chemistry Organic Chemistry Pa Yurkanis Bruice
Recommended books and references (scientific journals, reports…)	HETEROCYCLIC COMPOUNDS Co-Coordinator – Dr. Shalini Singh Clayden J. Organic chemistry Organic Chemistry Pa Yurkanis Bruice
Electronic References, Websites	HETEROCYCLIC COMPOUNDS Co-Coordinator – Dr. Shalini Singh Clayden J. Organic chemistry Organic Chemistry Pa Yurkanis Bruice

Course Description Form

1. Course Name: Physical Chemistry- Kinetic chemistry
2. Course Code:
3. Semester / Year: 1st Semester/Third Year
4. Description Preparation Date:2023-2024
5. Available Attendance Forms: Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)/2hours per weak for the theortical and 2hours per weak for the laboratory
2 hours for (Class lecture)+ 2 hours for (Lab) for 3 groups.
7. Course administrator's name (mention all, if more than one name)
Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam Email: asmaa.albayaty@nahrainuniv.edu.iq Lab Stuff: Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam Assist.: Eklas Abd Alkadar Lecturer Assistant :Ala'a Abd Al-Razaq Lecturer Assistant Doha Abd Al-KAream Lecturer Assistant :Aisha Jamal Jameal Lecturer Assistant Qutban Ibraheam Hussiean
8. Course Objectives
Course Objectives: The main goal of this course to give the basic principle of Kinetic chemitry and learn how can calculate the rate and order of the reaction and its applicti in chemistry.
9. Teaching and Learning Strategies

Strategy	1- Using the textbook which is available in the Department library a its specific for the undergraduate students, and the chapters Needed are Ch.22-23. 2- Give the homework 3- Present the lecutura and solve the problem for each sections

	Where is needed. 4- Do the quiz include the open book if it's needed. 5- Short review at the begging of each class. And make a sh conclusion at the end of the class.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Why we study Kinetic chemistry	The name of Subjects will Take during the Semester and why Need to study Kinetic chemistry.	Present the lectures	-
2-5	2	Answer why?	1-Kinetic 2-Expreation of reaction rate 3- The rate law and Its component 4- Homework	Present the lectures	Quiz Each Class
6-8	2	Answer why?	5- Reaction Order a its terminology in chemistry. 6-Determination of reaction order. 7- Determination of order and reaction rate Laws. 8- Homework	Present the lectures	Quiz

9-11	2	Answer why?	9- Determination of rate constant (K) 10- Integrated rate Law of first-order Reaction 11-Integrated rate Law of Second-Order Reaction. 12 - Integrated rate Law of Third-order Reaction 13- Integrated rate Law of Zero-order Reaction 14- Half life time -15 Raction rate And its Dependency On the temp. 16- Homework	Present the lectures	Quiz
12	2		Exam		
13	2		17Theories of Chemical Kinetic a-Collosion Theory b-Transion theory	Present the lectures	Quiz
14 15	2		Exam Answer questions		

11. Course Evaluation

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Physical Chemistry
Main references (sources)	Physical Chemistry
Recommended books and references (scientific journals, reports…)	-
Electronic References, Websites	-

Course Description Form

1 Course Name: Analytical Chemistry	
2 Course Code:	
3 Semester / Year:2023-2024	
4 Description Preparation Date: 20/3/2024	
5 Available Attendance Forms: presence	
6 Number of Credit Hours (Total) / Number of Units (Total): 8 Hours	
7 Course administrator's name (mention all, if more than one name)	
Name: Dr. Dalia Mahmood Jamil Email: Dalia.mahmood@nahrainuniv.edu.iq	
8 Course Objectives	
Course Objectives	**1.Teach students the most important basics of analytical separation methods and provide a comprehensive explanation of each method. 2.The basics of chromatography were learned and issues pec to this technique were solved.....**
9 Teaching and Learning Strategies	
Strategy	The main strategy to be adopted in delivering this unit is to encourage student participation in exercises provided during class, homework and tests. Furthermore, encourage student participation in discussion panels

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
First	2 Hours	A.Cognitive goals A1. Knowledge analytical separation metho A2-Solve the problems related each method A3- Understandin the basics methods	Separation and definition of Analytical Chemistry	Data Show	Exam
Second	2 Hours	Principate	Definition	Data Show	Exam
Third	2 Hours	Separation Organic and organic Compoun	Definition	Data Show	Exam
Fourth	2 Hours	Extraction a Separation Ions	Definition	Data Show	
Fifth	2 Hours	Distillation	Definition	Data Show	Exam
Sexth	2 Hours	Mid	----------	--------	Marked
Seventh	2 Hours	Chromatography	Definition	Data Show	Exam

11 Course Evaluation

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

12 Learning and Teaching Resources

Required textbooks (curricular books, if any)	Skooge
Main references (sources)	Book of analytical Chemistry- Cherry

	Book of analytical Chemistry- Skooge
Recommended books and references (scientific journals, reports…)	International journals affiliated with Elsiver and Clarivate in the field of methodological topics
Electronic References, Websites	New Paper in Course

Course Description Form

1 Course Name:
Analytical chemistry
2 Course Code:
121
3 Semester / Year:
Semester ((courses)) (second stage) 2024-2023 first semester
4 Description Preparation Date:
23/3/2024
5 Available Attendance Forms:
Attended lectures
6 Number of Credit Hours (Total) / Number of Units (Total)
60 h/ 3units
7 Course administrator's name (mention all, if more than one name)
Name: Rana Abd Hammza Email: rana.abd@nahrainuniv.edu.iq
8 Course Objectives

Course Objectives	• Introducing students to the basic concepts related to descriptive analysis methods • Focus on the method of precipitation of elements in descriptive analytical chemistry and calculating their quantities • Teach the student how to calculate the amount of regimented materials through the use of the sedimentation method.
9 Teaching and Learning Strategies	
Strategy	- Providing students with the basics and additional topics related to thinking outcomes - Discussing lesson topics that require thinking and analysis, with students participating In a mini-discussion circle during the lecture. - Raising a group of intellectual questions during the lecture time, which increases and Motivates students to analyze, conclude, and reach the correct answer. - Giving students homework that requires self-explanation - Linking the lecture curriculum with practical applications, especially with our daily lives

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2 hour	Introducing the stude to the subject of descriptive analysis i analytical chemistry	Introduction of Gravimetric analys and classification	Explanation of the article and Use of illustratio	Short oral and written exams
2	2 hour	Introduce the student the methods of sedimentation and the characteristics	gravimetric metho properties, precipitation gravimetric, examples	Explanation of the article and Use of illustratio	Short oral and written exams
3	2 hour	Learn about arithmeti methods	Calculation	Explanation of the article and Use of illustratio	Short oral and written exams

4	2 hour	Identify the best characteristics of the precipitating agent ar the methods of formir the precipitate	Properties of precipitates and precipitating agent	Explanation of the article and Use of illustratio	Short oral and written exams
5	2 hour	Identify the types of sediments and their specifications	factors that determine the particle size of precipitate, Colloic precipitate and structure ,	Explanation of the article and Use of illustratio	Short oral and written exams
6	2 hour		Mid Exam		
7	2 hour	Recognize the types sedimentation	coagulation of colloids, types of precipitation	Explanation of the article and Use of illustratio	Short oral and written exams
8	2 hour	Identify the sedimentation mechanism Identify t methods of	Mechanism of precipitate formati	Explanation of the article and Use of illustratio	Short oral and written exams
9	2 hour	sedimentation in homogeneous solutio	Precipitation from homogeneous solution, drying ar ignition of precipitate, types organic reagents	Explanation of the article and Use of illustratio	Short oral and written exams
10	2 hour	Identify the gravimetr method applications	Application of gravimetric metho	Explanation of the article and Use of illustratio	Short oral and written exams
11	2 hour	Learn about the types titration method and how to calculate it	types of titration curves, solubility precipitates, calculation	Explanation of the article and Use of illustratio	Short oral and written exams
12	2 hour	Identify the types of saturation of the mixture and how to calculate it	Titration curve for mixtures of anion, examples of indicators for precipitation titrati	Explanation of the article and Use of illustratio	Short oral and written exams
13	2 hour	Recognize how complexes are formed and how to correct th	Complexometric reaction and titration, EDTA titrations, EDTA equilibrium, titrati curves	Explanation of the article and Use of illustrations	Short oral and written exams
14	2 hour		Mid exam		Short oral and written exams
11 Course Evaluation					

Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports.... etc	
12 Learning and Teaching Resources	
Required textbooks (curricular books, if any)	1-Analytical chemistry, skoog 2nd edition Fundamentals of analytical chemistry, skoog 8th edition
Main references (sources)	1- Fundamentals of Analytical Chemistry 9e by Douglas A. Skoog" 2- Fundamentals of Analytical Chemistry 8e by Douglas A. Skoog
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Course Description Form

1. Course Name:
Analytical Chemistry - Chromatography
2. Course Code:
CHEM 322
3. Semester / Year:
Second semester / 2023-2024
4. Description Preparation Date:
23/03/2024
5. Available Attendance Forms:
attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
40
7. Course administrator's name (mention all, if more than one name)
Name: Dr. Sahar Samir Mohammed Alabdullah Email: sahar.alabdullh@nahrainuniv.edu.iq
8. Course Objectives

Course Objectives	**1**.Knowledge of chromatography concepts and their practical applications in laboratory and public life **2.** How to calculate different concentrations of a group of mixed materials and analyze them electrolyte **3.** Knowledge of chronographic types **4.** Know the account Chromatography and its applications **5.** Quantitative analysis for chemical mixtures in chromatography **6.** Electrophoresis and their general concept and applications**.**

9. Teaching and Learning Strategies	
Strategy	A- **Cognitive goals.** A1. Like learning A2- Attention A3- General interaction with the professor during the lecture **B. The skills goals special to the course.** B1 - attraction and interaction B2 - Questions B3 - Interaction with scientific activities

	Teaching and Learning Methods Power point paper lectures Examples from YouTube and the Internet **Assessment methods** Frequent participation, continuous attendance, daily interaction during t lecture time, and daily and monthly exam scores C. Affective and value goals C1. Attention C 2. Attendance C 3. Sending the reasons for the emergency absence C4. Respect the time of the lectures and delivery of duties on time D. General and rehabilitative transferred skills(other skills relevant employability and personal development) D1. Act diplomatically and respect others D2. Respect for colleagues

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
introduction	2	Questions	chromatography and its applications, detailed explanation, direct questions students	Detailed explanation	introduction
	2		Liquid chromatography	Detailed explanation	
	2		Chromatography	Detailed explanation	Daily exam
Lecture	2		chromatography	Detailed explanation	
	2	Solve problems and answers	Gas chromotography	Power point	
	2	Equations examples	Gas chromotography	Power point	
	2		electrophoresis	Power point	
	2				Mid exam

11. Course Evaluation

Distributing the score out of 100 according to the tasks assigned to the student
daily preparation,
exam after each 4 weeks as monthly
written exams
reports
activities during the course

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	1. Fundamentals of Analytical Chemistry by Douglas A. Skoog 2. Principles of Instrumental Analysis, 7th Edition
Main references (sources)	**1.** Fundamentals of Analytical Chemistry by Douglas A. Skoog

	2. Principles of instrumental analysis (Skoog, Douglas
Recommended books and references (scientific journals, reports...)	chemical journals Material sciences Chromatographic books
Electronic References, Websites	Google scholar

Course Description Form

1. Course Name: Physical chemistry

2 Course Code:

3 Semester / Year:

Second semester/fourth year

4 Description Preparation Date:

7/10/2023

5 Available Attendance Forms:

Attendance time

6 Number of Credit Hours (Total) / Number of Units (Total)

30

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

Name: Dr. Khalida Abaid Samawi
Email: khalida.samawi@nahrainuniv.edu.iq

8 Course Objectives

Course Objectives	• Rotational movement • Hydrogen atom

9 Teaching and Learning Strategies

Strategy	1- Providing the students with the basics and additional topics related to thinking outcomes 2- Discuss the topics of the lesson that require focus and thinking 3- Ask a set of intellectual questions during the lecture, which motivates the students to focus and conclusions Giving the students homework to motivate them to search by solving th

10 Course Structure

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

1	2	introduction to the rotational energy of the molecule, the Schrödinger equation and th wave function	-Rotational motion of a particle -The schrodinger equation and the wave function	Explanation and demonstration tools	Short oral and written exams
2	2	-consistency - stifle energy A molecule in a spherical surfac	-Normalization - Quantization of energy - Particle on sphere	Explanation an demonstration tools	Short oral and written exams
3	2	-Schroedinger equation -Separation of variables	-The schrodinger equation -Separation of variable -The P-equation – Legendre and associated legendre with examples	Explanation an demonstration tools	Short oral a writte exam
4	2	perfect wave function Physical	-Orthonormality of the P(theta) functions -The comple wave functio (Spherical Harmonic)	Explanation an demonstration tools	Short oral a writte exam
5	2	-representation rotational oscillator and introduction to angular momentum	-Physical Representation of spherical harmonics -Introduction to angular momentum	Explanation and demonstration tools	Short oral a writte exam
6	2		Mid Exam	Explanation an demonstration tools	Short oral a writte exam

7	2	3D Rotation of Particle with Examples	-Three dimension rotation when the particle rotates in the components -Example	Explanation an demonstration tools	Shor oral a writte exam
8	2	Quantum energ angular momentum, an spin of diatomi molecules	-Quantization of energy and angular momentum -Rotation of diatomic molecules (rigid rotator	Explanation an demonstration tools	Short oral and written exams
9	2	Hydrogen, hydrogen-like atoms, and thei eigenvalues	-Hydrogen and hydrogen like atoms - The energy eigen values	Explanation an demonstration tools	Short oral and written exams
10	2	perfect wave function	-Complete wave functio or atomic orbitals of hydrogen like atoms	Explanation an demonstration tools	Short oral and written exams
11	2	Importance of quantum numbers n,l,m with examples	--Significance of the quantum numbers n,l,M --Examples	Explanation an demonstration tools	
12	2	Coordinated wave functions hydrogen-like atoms, Zeeman phenomenon, a magnetic quantum numb	-Normalized hydrogen-like wave functions -Zeeman effect an magnetic quantun number	Explanation an demonstration tools	Short oral and written exams
13	2	Atomic orbitals	-Atomic orbitals -Orbitals in real form -Example	Explanation an demonstration tools	Short oral and written exams
14	2		Mid Exam	Explanation an demonstration tools	Short oral and written exams
15	3		Mid exam		

11 Course Evaluation

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

12 Learning and Teaching Resources

Required textbooks (curricular books, if any)	1-Physical chemistry, Peter Atkins 8th edition 2- Physical chemistry, Peter Atkins 9th editi
Main references (sources)	-
Recommended books and references (scientific journals, reports…)	-
Electronic References, Websites	-

Course Description Form

1. Course Name: Physical Chemistry- Kinetic chemistry
2. Course Code:
3. Semester / Year: 1st Semester/Third Year
4. Description Preparation Date:2023-2024
5. Available Attendance Forms: Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)/2hours per weak for the theortical and 2hours per weak for the laboratory
2 hours for (Class lecture)+ 2 hours for (Lab) for 3 groups.
7. Course administrator's name (mention all, if more than one name)
Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam Email: asmaa.albayaty@nahrainuniv.edu.iq Lab Stuff: Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam Assist.: Eklas Abd Alkadar Lecturer Assistant :Ala'a Abd Al-Razaq Lecturer Assistant Doha Abd Al-KAream Lecturer Assistant :Aisha Jamal Jameal Lecturer Assistant Qutban Ibraheam Hussiean
8. Course Objectives
Course Objectives: The main goal of this course to give the basic principle of Kinetic chemitry and learn how can calculate the rate and order of the reaction and its applicti in chemistry.
9. Teaching and Learning Strategies

Strategy	1- Using the textbook which is available in the Department library a its specific for the undergraduate students, and the chapters Needed are Ch.22-23. 2- Give the homework 3- Present the lecutura and solve the problem for each sections

	Where is needed. 4- Do the quiz include the open book if it's needed. 5- Short review at the begging of each class. And make a sh conclusion at the end of the class.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Why we study Kinetic chemistry	The name of Subjects will Take during the Semester and why Need to study Kinetic chemistry.	Present the lectures	-
2-5	2	Answer why?	1-Kinetic 2-Expreation of reaction rate 3- The rate law and Its component 4- Homework	Present the lectures	Quiz Each Class
6-8	2	Answer why?	5- Reaction Order a its terminology in chemistry. 6-Determination of reaction order. 7- Determination of order and reaction rate Laws. 8- Homework	Present the lectures	Quiz

9-11	2	Answer why?	9- Determination of rate constant (K) 10- Integrated rate Law of first-order Reaction 11-Integrated rate Law of Second-Order Reaction. 12 - Integrated rate Law of Third-order Reaction 13- Integrated rate Law of Zero-order Reaction 14- Half life time -15 Raction rate And its Dependency On the temp. 16- Homework	Present the lectures	Quiz
12	2		Exam		
13	2		17Theories of Chemical Kinetic a-Collosion Theory b-Transion theory	Present the lectures	Quiz
14 15	2		Exam Answer questions		

11. Course Evaluation

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Physical Chemistry
Main references (sources)	Physical Chemistry
Recommended books and references (scientific journals, reports…)	-
Electronic References, Websites	-

Course Description Form

1. Course Name: Electrochemistry
2. Course Code:
3. Semester / Year: second Semester/Third Year
4. Description Preparation Date:2023-2024
5. Available Attendance Forms: Attendance
6. Number of Credit Hours (Total) / Number of Units (Total)/2hours per weak for the theortical and 2hours per weak for the laboratory
2 hours for (Class lecture)+ 2 hours for (Lab) for 3 groups.
7. Course administrator's name (mention all, if more than one name)
Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam Email: asmaa.albayaty@nahrainuniv.edu.iq Lab Stuff: Name: Assist. Prof.Dr.Asmaa Yahya Ibraheam Assist.: Eklas Abd Alkadar Lecturer Assistant :Ala'a Abd Al-Razaq Lecturer Assistant Doha Abd Al-KAream Lecturer Assistant :Aisha Jamal Jameal Lecturer Assistant Qutban Ibraheam Hussiean
8. Course Objectives
Course Objectives: The main goal of this course to give the basic principle of Electrochemistry and learn how can calculate the EMF of the cell and its applictions in chemis
9. Teaching and Learning Strategies

Strategy	1- Using the textbook which is available in the Department library a its specific for the undergraduate students, and the chapters Needed are Ch.22-23. 2- Give the homework 3- Present the lecutura and solve the problem for each sections Where is needed.

	4- Do the quiz include the open book if it's needed. 5- Short review at the begging of each class. And make a sh conclusion at the end of the class.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Why we study Electrochemistry	The name of Subjects will Take during the Semester and why Need to study Electrochemistry.	Present the lectures	-
2-5	2	Answer why?	1-Electrical conductivity of solutions. 2- equivalent conductance. 3-The Arrhenius Theory of Dissociation 4- Collective properties of Aqueous solutions electrolyte. 5-Dissociation of equilibrium.	Present the lectures	Quiz Each Class
6-8	2	Answer why?	- Electrolysis and electrode process 7-Transfer Numbers 8-Ionic Conductanc 9- Ionic mobility 10- Applications of conductivity 11- Dielectric constants and the role of solvent	Present the lectures	Quiz
		Answer why?			

9-11	2		12- Conductance of strong Electrolyte. 13- Types of electrodes 14- EMF of Cell 15- Applications of EMF a- Thermodynamic Functions 16- Discuss the Debye-Hukel theory and its applications 17- Types of cells 18-PH definitions a measurements 19- Calculate the Ksp,Kth…ect.	Present the lectures	Quiz
12	2		Exam		
13	2		Answer questions		
14	2		Exam		
15	2		Answer questions		

11. Course Evaluation

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

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Physical Chemistry
Main references (sources)	Physical Chemistry
Recommended books and references (scientific journals, reports…)	-
Electronic References, Websites	-

Course Description Form

Course Name:	
Physical chemistry	
Course Code:	
CHEM 241	
Semester / Year:	
Second semester /2024	
Description Preparation Date:	
1/9/2023	
Available Attendance Forms:	
Attending lectures+ lab	
Number of Credit Hours (Total) / Number of Units (Total)	
30 theory + 30 practical lab	
Course administrator's name (mention all, if more than one name)	
Name: abeer khazaal shams Email: abeer.k.shams@nahrainuniv.edu.iq	
Course Objectives	
Course Objectives	1. Understanding the fundamental gas laws, including Boyle's law, Charles's law, and Avogadro's law, and their mathematical relationships. 2. Applying gas laws to predict the behavior of ideal gases under different conditions of pressure, volume, and temperature. 3. Solving numerical problems involving gas properties, such as finding unknown variables using the ideal gas equation. 4. Analyzing deviations from ideal gas behavior and understanding the concept of real gases. 5. Exploring the concept of gas mixtures and applying the laws to analyze gas mixtures' properties. 6. Understanding the concept of energy and its various forms, such as internal energy, work, and heat. 7. Applying the First Law to analyze various thermodynamic processes, such as isothermal, adiabatic, and isobaric processes. 8. Evaluating and calculating the energy transfer as work and heat in different systems and processes. 9. Understanding the relationship between the First Law and the concepts of enthalpy and specific heat capacity. 10. Recognizing the importance of the First Law in understanding energy efficiency and energy conservation in various applications and processes. 11. Demonstrating the ability to perform energy calculations and problem-solving exercises involving the First Law of Thermodynamics. 12. Communicating effectively about gas laws and the First Law of Thermodynamics through written reports and presentations.
Teaching and Learning Strategies	
Strategy	Multiple methods are used to ensure access to scientific material and achieve the objectives of the curriculum through:

	Interactive lessons: These include discussions and interactive exercises that encourage student participation and engagement with the educational content. Cooperative learning: Relies on student collaboration to solve homework assignments and learning tasks distributed to them. Self-learning: Involves holding seminars to present and discuss various topics, focusing on motivating students to use available learning resources and develop their self-learning skills. Use of modern techniques: Includes the use of technological tools such as computing and multimedia in the teaching and learning process.

Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Connect particle behavior to macroscopic properties of the gas. Connect symbolic representations of pressure, temperature, volume, and particle number to model representations and to real-world measurements.	The states of matter and gases laws	Explanation and examples	
2	2	Define and explain effusion and diffusion State Graham's law and use it to compute relevant gas properties	The molar volume of a gas, Dalton's Law, Graham's Law of Diffusion and Effusion	Explanation and examples	
3	2	Describe the physical factors that lead to deviations from ideal gas behavior	non-ideal gas behavior, The compression factor, Z, Differentiate between Macroscopic and	Explanation and examples	

		Explain how these factors are represented in the van der Waals equation Define compressibility (Z) and describe how its variation with pressure reflects non-ideal behavior Quantify non-ideal behavior by comparing computations of gas properties using the ideal gas law and the van der Waals equation	Microscopic Approaches		
4	2	Use kinetic molecular theory to explain the properties of gases,	kinetic theory of gases, Maxwell-Boltzmann distribution curve	Explanation and examples	
Exam I	2				MIDTERM #1 Duration: 60 min;
6	2	Use thermodynamic terminology correctly. 2. Explain fundamental thermodynamic properties.	Thermodynamic equilibrium,the zero law of thermodynamics,	Explanation and examples	
7	2	State the first law of thermodynamics Define enthalpy and explain its classification as a state function Write and balance	THE FIRST LAW OF THERMODYNAMIC	Explanation and examples	

		thermochemical equations Calculate enthalpy changes for various chemical reactions Explain Hess's law and use it to compute reaction enthalpies			
8	2		Seminar	Explanation and examples	
9	2	Students will understand the difference between heat and temperature. 2) Students will understand how heat transfers. 3) Students will be able to distinguish between an endothermic and exothermic process. 4) Students will be able to identify and explain the effect temperature and heat have on the rate of a chemical reaction	Thermochemistry	Explanation and examples	
Exam II	2				MIDTERM #2 Duration: 60 min;
11	2	Explain the technique of calorimetry Calculate and interpret heat and related	Calorimetry	Explanation and examples	

		properties using typical calorimetry data			
12	2	Understand the concept of heat of reaction. Understand the difference between exothermic and endothermic reactions. Use heat of reaction in calculations. Use the extent of reaction in heat of reaction calculations.	Types of heat of a reaction	Explanation and examples	
13	2		HESS'S LAW, Kirchhoff's Law	Explanation and examples	
14	2	Describe the concepts of Work done in chemical process • Apply thermodynamic principles to solve practical problems in physical and chemical systems.	Work done in chemical process	Explanation and examples	
15	2		Seminar	Explanation and examples	

Course Evaluation	
Quizzes	10%
Midterms examination	70%
Seminar	15%
Attend	5%
Total	100%

Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Physical Chemistry/ P.W.Atkins/ 9th edition / Oxford university press/ 2009
Main references (sources)	Laidler, K.J.; Meiser,J.H. and Sauctuary, B.C./ Physical chemistry/ 4th edition/ Houghton Mifflin Co. / N.Y. / 2003

Recommended books and references (scientific journals, reports...)	Haddad, W.M. Thermodynamics: The Unique Universal Science. Entropy 2017, 19, 621. https://doi.org/10.3390/e19110621
Electronic References, Websites	https://chem.libretexts.org/Special:FirstLoginWelcome?return=

Course Description Form

Course Name:	
Physical chemistry	
Course Code:	
CHEM 242	
Semester / Year:	
Second semester /2024	
Description Preparation Date:	
1/9/2023	
Available Attendance Forms:	
Attending lectures+ lab	
Number of Credit Hours (Total) / Number of Units (Total)	
30 theory + 30 practical lab	
Course administrator's name (mention all, if more than one name)	
Name: abeer khazaal shams Email: abeer.k.shams@nahrainuniv.edu.iq	
Course Objectives	
Course Objectives	Understand the fundamental concepts of the second and third laws of thermodynamics, including entropy, heat transfer, and energy conversion. Apply thermodynamic principles to analyze and solve problems related to heat engines, refrigeration systems, power generation, and other thermodynamic processes. Explore how substances transition between phases based on changes in temperature and pressure. Study the phase rule, which governs equilibrium conditions in multi-component systems, including one-component and two-component systems and their phase equilibria. Learn about concepts such as vapor-pressure diagrams, temperature-composition diagrams, and phase boundaries. Understand the concept of chemical potential and its role in achieving equilibrium during phase transitions. Estimate the heat of phase transition based on vapor pressures measured at two temperatures, using the Clapeyron and Clausius-Clapeyron equations.
Teaching and Learning Strategies	
Strategy	Multiple methods are used to ensure access to scientific material and achieve the objectives of the curriculum through: Interactive lessons: These include discussions and interactive exercises that encourage student participation and engagement with the educational content.

	Cooperative learning: Relies on student collaboration to solve homework assignments and learning tasks distributed to them. Self-learning: Involves holding seminars to present and discuss various topics, focusing on motivating students to use available learning resources and develop their self-learning skills. Use of modern techniques: Includes the use of technological tools such as computing and multimedia in the teaching and learning process.

Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Gases law and first law of thermodynamic	Refreshment of T.D. equations	Explanation and examples	
2	2	-Define the second law - calculate the Engine efficiency	Second law of thermodynamic ,carnot engine	Explanation and examples	
3	2	Define entropy Calculate the increase of entropy in a system with reversible and irreversible processes Calculate the increasing disorder of a system	Entropy, microscopic definition of entropy, entropy change for a phase transition	Explanation and examples	
4	2	Calculate the entropy for different thermodynamic process	The Calculation of Entropy Changes	Explanation and examples	
Exam I	2				MIDTERM #1 Duration: 60 min;
6	2	-Define Helmholtz and free energy functions the change in the Helmholtz	Free energy function	Explanation and examples	

		energy to the maximum work			
7	2	Using Gibbs–Helmholtz equation	Combining the First and Second Laws, Gibbs–Helmholtz equation,	Explanation and examples	
8	2	Rate equilibrium constant	Applications of the free energy function	Explanation and examples	
9	2	(a) Chemical potential for pure substance: (i) pure ideal gases (ii) pure liquid (iii) pure real gases. (b) Chemical potential for mixtures of ideal gases - partial molar Gibbs free energy, the fundamental equation of chemical thermodynamics	Chemical potential , the fundamental equation of chemical thermodynamics	Explanation and examples	
Exam II	2				MIDTERM #2 Duration: 60 min;
11	2	• To understand the basics of a one-component phase diagram as a function of temperature and pressure in a closed system. • To be able to identify the triple point, the critical point, and four regions: solid, liquid, gas, and a supercritical fluid.	Phase equilibrium	Explanation and examples	

12	2		Chemical equilibrium, Thermodynamic equilibrium constant Vant Hoff equations	Explanation and examples	
13	2		Seminar	Explanation and examples	
14	2	Determine the Partial molar quantities ,Partial molar volume Partial molar Gibbs free energy	Thermodynamic description of mixtures	Explanation and examples	
15	2		Seminar	Explanation and examples	

Course Evaluation	
Quizzes	10%
Midterms examination	70%
Seminar	15%
Attend	5%
Total	100%

Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Physical Chemistry/ P.W.Atkins/ 9th edition / Oxford university press/ 2009
Main references (sources)	Laidler, K.J.; Meiser,J.H. and Sauctuary, B.C./ Physical chemistry/ 4th edition/ Houghton Mifflin Co. / N.Y. / 2003
Recommended books and references (scientific journals, reports...)	Haddad, W.M. Thermodynamics: The Unique Universal Science. Entropy 2017, 19, 621. https://doi.org/10.3390/e19110621
Electronic References, Websites	https://chem.libretexts.org/Special:FirstLoginWelcome?return=

Course Description Form

1 Course Name: Biochemistry

2 Course Code: CHEM 352

3 Semester / Year: Second/ three

4 Description Preparation Date:22/3/2024

5 Available Attendance Forms: Attendance Forms

6 Number of Credit Hours (Total) / Number of Units (Total): 30 hours/ 2 units

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

Name: Assist. Prof. Dr. Farah A. Rashid , Assist. Prof. Dr.suhad AbdulAzeez Ibrahim
Email: farah.rashid@nahrainuniv.edu.iq. Suhad.ibrahiem@nahrainuniv.edu.iq

8 Course Objectives

Course Objectives	• To let the student know about the fundamental principle of clinical biochemistry. • Focus on how hormones work and clinical analysis of some enzymes

9 Teaching and Learning Strategies

Strategy	• Providing students with basics and topics related to thinking outcome • Discuss the topic of lesson that required thinking and analysis • Raise a set of thinking question during lectures, which increases and motivates student to analyze and conclude Giving student homework that requires self-explanation

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Utilization of Inorga Nitrogen	Nitrogen cycle , Nitro fixation	Explanation by using clarify tools	Short Oral and written exams

2	2	Biogenesis of orga nitrogen	Reductive amination of α-ketoglutarate,Glutamate synthase ,Glutamine Synthetas Aspargin Synthetase, Carbomyl phosphate synthetas	Explanation by using clarify tools	Short Oral and written exams
3	2	Aspects of a.a. synthesis and degredation	1-Metabolic consequence of the absence of nitrogen storage compounds. 2-Biosynthesis capacities of organisms 3- Transamination	Explanation by using clarify tools	Short Oral and written exams
4	2	A.A. Degradation and metabolism of nitrogenous compounds	1- Common features of A.A. degradation pathways. 2-Fates of amino acid carbon skeleton 3-	Explanation by using clarify tools	Short Oral and written exams
5	2	Urea Cycle	[1] Detoxifying and excretion of ammonia [2] Urea cycle	Explanation by using clarify tools	Short Oral and written exams
6	2	**Mid1**	**Mid1**	**Mid1**	**Mid1**
7	2	**Ketone body formation Ketolysis and ketogenesis**	ketone metabolism	Explanation using clarify to	Short Oral written ex
8	2	**ketosis**	ketone metabolism	Explanation using clarify to	Short Oral written ex
9	2	**Cholesterol pathway**	Lipid metabolism	Explanation using clarify to	Short Oral written ex
10	2	Salvage pathway, prpp: central metabolite in de novo and salvage pathways	nucleotide metabolism biosynthetic routes	Explanation using clarify to	Short Oral written ex
11	2	De novo synthesis of ATP , GTP	De novo pathway Purin synthesis	Explanation using clarify to	Short Oral written ex
12	2	uric acid formation , uracil and citidin formation	purine degradation, de n synthesis of pyrimidine	Explanation using clarify to	Short Oral written ex
13	2	**Formation of deoxyribonucleotides**	**Ribonucleotide reductase (RNR)**	Explanation using clarify to	Short Oral written ex
14	2	**Nucleotide degrdation**		Explanation using clarify to	Short Oral written ex
15	**Mid2**	**Mid2**	**Mid2**	**Mid2**	**Mid2**

11 Course Evaluation

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

12 Learning and Teaching Resources

Required textbooks (curricular books, if any)	**Biochemistry 4th Edition** by Christopher Mathews (Author), Kensal van Holde (Author), Dean Appling (Author)
Main references (sources)	**Lehninger Principles of Biochemistry, 4th Edition** by David L. Nelson (Author), Michael M. Cox
Recommended books and references (scientific journals, reports…)	Biochemistry. Jeremy M. Berg, John L. Tymoczko, Lubert– International Edition
Electronic References, Websites	https://www.pearson.com/en-gb/highered-students.html

Course Description Form

1 Course Name: Biochemistry

2 Course Code: CHEM 451

3 Semester / Year: First/ Four

4 Description Preparation Date:22/3/2024

5 Available Attendance Forms:

6 Number of Credit Hours (Total) / Number of Units (Total): 30 hours/ 2 units

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

Name: Assist. Prof. Dr. Farah A. Rashid , Assist. Prof. Dr.Suhad abdulazeez ibrahim
Email: farah.rashid@nahrainuniv.edu.iq. Suhad.ibrahiem@nahrainuniv.edu.iq

8 Course Objectives

Course Objectives	• To let the student know about the fundamental principle of clinical biochemistry. • Focus on how hormones work and clinical analysis of some enzymes

9 Teaching and Learning Strategies

Strategy	• Providing students with basics and topics related to thinking outcome • Discuss the topic of lesson that required thinking and analysis • Raise a set of thinking question during lectures, which increases and motivates student to analyze and conclude Giving student homework that requires self-explanation

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introducing students to Endocrinology	**Endocrinology**	Explanation by using clarify tools	Short Oral and written exams
2	2	Introducing students to Pituitary Gland	**Pituitary gland**	Explanation by using clarify tools	Short Oral and written exams
3	2	Introducing the students to	**Hormones and receptors**	Explanation by using clarify tools	Short Oral and written exams

		hormones and their receptors			
4	2	Introducing the students to adrenal gland and its disease	**Adrenal Gland**	Explanation by using clarify tools	Short Oral and written exams
5	2	Introducing the students to thyroid gland and its disease	**Thyroid Gland**	Explanation by using clarify tools	Short Oral and written exams
6	2	**Mid1**	**Mid1**	**Mid1**	**Mid1**
7	2	Introducing the students to function of kidney and its disease	**kidney**	Explanation using clarify to	Short Oral written exams
8	2	Introducing the students to function of important of Na,K,Cl and its disease	The Importance of Na, K, Assays in Clinical Practice	Explanation using clarify to	Short Oral written exams
9	2	The extent of its impact and diseases related to it	Understanding the chemistry sodium electrolyte and its rela diseases	Explanation using clarify to	Short Oral written exams
10	2	The extent of its impact and diseases related to it	Understanding the chemi of potassium electrolyte related diseases	Explanation using clarify to	Short Oral written exams
11	2	The extent of its impact and diseases related to it	Understanding the chemi of calcium, phosphate, magnesium and mat related to them	Explanation using clarify to	Short Oral written exams
12	2	The extent of its impact and diseases related to it	Study of kidney function tes	Explanation using clarify to	Short Oral written exams
13	2	Functions and processes of food metabolism	Study of liver chemistry	Explanation using clarify to	Short Oral written exams
14	2	The extent of its impact and diseases related to it	Study of liver chemistry and l function tests	Explanation using clarify to	Short Oral written exams
15	2	**Mid2**	**Mid2**	**Mid2**	**Mid2**

11 Course Evaluation

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

12 Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Clinical Biochemistry, Zalva, 2nd edition Lippincott's Illustrated Reviews: Biochemistry Fifth EditionRichard A. Harvey, PhD
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Biochemistry. Jeremy M. Berg, John L. Tymoczko, Lubert– International Edition
Electronic References, Websites	**Electronic book** Clinical Biochemistry, Allan Gaw, Robert A. Crowan, Denis. St. J.O'Reilly, Micheal J. Stewa and James Shepherd, 2nd edition, Churchill livingstone, UK

Course Description Form

1 Course Name: Biochemistry

2 Course Code: CHEM 451

3 Semester / Year: First/ Four

4 Description Preparation Date:22/3/2024

5 Available Attendance Forms:

6 Number of Credit Hours (Total) / Number of Units (Total): 30 hours/ 2 units

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

Name: Assist. Prof. Dr. Farah A. Rashid , Assist. Prof. Dr.Suhad abdulazeez ibrahim
Email: farah.rashid@nahrainuniv.edu.iq. Suhad.ibrahiem@nahrainuniv.edu.iq

8 Course Objectives

Course Objectives	• To let the student know about the fundamental principle of clinical biochemistry. • Focus on how hormones work and clinical analysis of some enzymes

9 Teaching and Learning Strategies

Strategy	• Providing students with basics and topics related to thinking outcome • Discuss the topic of lesson that required thinking and analysis • Raise a set of thinking question during lectures, which increases and motivates student to analyze and conclude Giving student homework that requires self-explanation

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Introducing students to Endocrinology	**Endocrinology**	Explanation by using clarify tools	Short Oral and written exams
2	2	Introducing students to Pituitary Gland	**Pituitary gland**	Explanation by using clarify tools	Short Oral and written exams
3	2	Introducing the students to hormones and their receptors	**Hormones and receptors**	Explanation by using clarify tools	Short Oral and written exams

4	2	Introducing the students to adrenal gland and its disease	**Adrenal Gland**	Explanation by using clarify tools	Short Oral and written exams
5	2	Introducing the students to thyroid gland and its disease	**Thyroid Gland**	Explanation by using clarify tools	Short Oral and written exams
6	2	**Mid1**	**Mid1**	**Mid1**	**Mid1**
7	2	Introducing the students to function of kidney and its disease	**kidney**	Explanation using clarify to	Short Oral written exams
8	2	Introducing the students to function of important of Na,K,Cl and its disease	The Importance of Na, K, Assays in Clinical Practice	Explanation using clarify to	Short Oral written exams
9	2	The extent of its impact and diseases related to it	Understanding the chemistry sodium electrolyte and its rela diseases	Explanation using clarify to	Short Oral written exams
10	2	The extent of its impact and diseases related to it	Understanding the chemi of potassium electrolyte related diseases	Explanation using clarify to	Short Oral written exams
11	2	The extent of its impact and diseases related to it	Understanding the chemi of calcium, phosphate, magnesium and matt related to them	Explanation using clarify to	Short Oral written exams
12	2	The extent of its impact and diseases related to it	Study of kidney function tes	Explanation using clarify to	Short Oral written exams
13	2	Functions and processes of food metabolism	Study of liver chemistry	Explanation using clarify to	Short Oral written exams
14	2	The extent of its impact and diseases related to it	Study of liver chemistry and l function tests	Explanation using clarify to	Short Oral written exams
15	2	**Mid2**	**Mid2**	**Mid2**	**Mid2**

11 Course Evaluation

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

12 Learning and Teaching Resources

Required textbooks (curricular books, if any)	Clinical Biochemistry, Zalva, 2nd edition Lippincott's Illustrated Reviews: Biochemistry Fifth EditionRichard A. Harvey, PhD
Main references (sources)	
Recommended books and references (scientific journals, reports…)	Biochemistry. Jeremy M. Berg, John L. Tymoczko, Lubert– International Edition
Electronic References, Websites	**Electronic book** Clinical Biochemistry, Allan Gaw, Robert A. Crowan, Denis. St. J.O'Reilly, Micheal J. Stewa and James Shepherd, 2nd edition, Churchill livingstone, UK

Course Description Form

1 Course Name:
Geology
2 Course Code:
3 Semester / Year:
1st Semester / 2023-2024
4 Description Preparation Date:
23/3/2024
5 Available Attendance Forms:
In Class
6 Number of Credit Hours (Total) / Number of Units (Total)
30 h/ 2 units
7 Course administrator's name (mention all, if more than one name)
Name: Mustafa Sabih Abdallh Email: mustafa.abdallh@nahrainuniv.edu.iq
8 Course Objectives

Course Objectives	• Introducing student to principles of geology
9 Teaching and Learning Strategies	
Strategy	• Scientific lecture • Educational videos

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2		Introduction to geolo	Lec.	
2	2		Geology and science	Lec. and videos	Students presentation
3	2		Earth format hypothesis	Lec. and videos	HW
4	2		Earth spheres	Lec. and videos	Quiz
5	2		Exam		
6-7	4		Metals	Lec. and videos	Quiz
8-9	4		crystallography	Lec. and videos	HW
10	2		Introduction on rocks cycle	Lec. and videos	Students presentation
11-12	4		Presentation	Group discussion	
13	2		Igneous rocks	Lec. and videos	HW

14	2		Sedimentary rocks	Lec.	Students presentation

11 Course Evaluation

daily oral, attendance and home work: 5%
written exams: 25%
presentation: 10%
Final exam: 60%

12 Learning and Teaching Resources

Required textbooks (curricular books, if any)	An Introduction to Geology, Chris Johnson, Matthew D. Affolter, Paul Inkenbrandt, Cam Mosher, 2017
Main references (sources)	Earle, S. (2015). *Physical Geology*. Victoria, B BCcampus.
Recommended books and references (scientific journals, reports…)	The journal of geology
Electronic References, Websites	Elsevier Wikipedia

Course Description Form

1 Course Name:

Industrial Chemistry
2 Course Code:
CHEM 462
3 Semester / Year:
2nd Semester / 2023-2024
4 Description Preparation Date:
23/3/2024
5 Available Attendance Forms:
In Class
6 Number of Credit Hours (Total) / Number of Units (Total)
30 h/ 3 units
7 Course administrator's name (mention all, if more than one name)
Name: Mustafa Sabih Abdallh Email: mustafa.abdallh@nahrainuniv.edu.iq
8 Course Objectives

Course Objectives	• Principles of industrial chemistry • Introducing students to the theories that g a description of bonding method betw monomers and polymeric structures • The reaction mechanisms and techniques
9 Teaching and Learning Strategies	
Strategy	• Scientific lecture • Electronic lectures • Educational videos

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2		Polymers-basic concepts	Lec. videos	
2	2		Polymers classifications	Lec. videos	Quiz/ HW
3	2		Thermosets thermoplastics	Lec. videos	Quiz
4	2		Stereo chemistry polymers	Lec. videos	Quiz
5-6	4		Polymer Struct Property	Lec. videos	Quiz/Hw
7-8	4		Polymer synthes	Lec. videos	

9	2		Exam		
10-1	4		Polymerization technique	Lec. videos	Quiz
12	2		Presentation	Group discussion	
13	2		Degradation, Stability, Environmental Issues	Lec. videos	

11 Course Evaluation

daily oral, attendance and home work: 5%
written exams: 20%
Laboratory: 15%
Final exam: 60%

12 Learning and Teaching Resources

Required textbooks (curricular books, if any)	Ali, M. F., El, A. B. M., & Speight, J. G. (2005). *Handbook of industrial chemistry: Organic chemicals*. New York: McGraw-Hill.
Main references (sources)	Manas Chanda , Introduction to Polymer Science & Chemistry, CRC Press Taylor & Francis Group
Recommended books and references (scientific journals, reports…)	Polymer chemistry, Macromolecules
Electronic References, Websites	Elsevier Wikipedia

Course Description Form

1	Course Name: Industrial Chemistry
2	Course Code: CHEM 362
3	Semester / Year: 2nd / 3rd
4	Description Preparation Date: 22/03/2024
5	Available Attendance Forms: Physical and online
6	Number of Credit Hours (Total) / Number of Units (Total): 30hrs.
7	Course administrator's name (mention all, if more than one name)
	Name: Khalid Waleed Younus Zainulabdeen Email: Khalid.waleed21@nahrainuniv.edu.iq
8	Course Objectives

Course Objectives	• Understand the fundamental concepts of petroleum chemistry, including the composition, properties, an behavior of hydrocarbons and other organic compounds found in crude oil and natural gas reservoirs. • Explore the processes involved in the formation, migration, and accumulation of petroleum and natur gas deposits within geological formations, and the factors influencing their distribution and characteristics. • Examine the principles of petroleum refining, includ the various unit operations and processes used to convert crude oil into valuable products such as gasoline, diesel, jet fuel, and petrochemical feedstoc • Analyze the chemical reactions and transformations occurring during petroleum refining processes, such distillation, cracking, reforming, hydrotreating, and catalytic conversion, and their impact on product quality and yield. • Investigate the properties and applications of petroleum-based products and derivatives, including fuels, lubricants, solvents, polymers, and specialty chemicals, and their role in various industries and sectors of the economy. • Explore the environmental and sustainability aspect petroleum chemistry, including the impact of petroleum extraction, refining, and utilization on air and water quality, climate change, and ecosystem health, and the strategies for mitigating adverse effe and promoting sustainable practices. • Develop critical thinking and problem-solving skills through laboratory experiments, case studies, and research projects related to petroleum chemistry, an apply theoretical knowledge to practical applications and real-world challenges in the petroleum industry.

	• Enhance communication and teamwork skills by engaging in group discussions, presentations, and collaborative projects, and effectively communicate scientific findings and recommendations to diverse stakeholders, including peers, industry professionals and the public. • Foster a deeper appreciation for the interdisciplinary nature of petroleum chemistry, and its intersections with geology, engineering, environmental science, economics, and policy, and the importance of interdisciplinary collaboration in addressing comple energy and environmental challenges.
9 Teaching and Learning Strategies	
Strategy	1. Lectures: Traditional lectures delivered by the instructor provide foundational knowledge and theoretical concepts in petroleum chemistry. Lectures may incorporate multimedia presentations, visual aids, and real-world examples to enhance understanding and engagement. 2. Laboratory Work: Hands-on laboratory experiments allow students to apply theoretical concepts learned in lectures to practical settings. Laboratory work may include chemical analysis of crude oil and petroleum products, characterization of hydrocarbon properties, and simulation of refining processes. 3. Case Studies: Case studies present real-world scenarios and challenges encountered in petroleum industry, encouraging students to apply critical thinking and problem-solving skills to analyze and propose solutions. Case studies may cover topics such as exploration and production, refining operations, environmental impact assessment, and regulatory compliance. 4. Group Projects: Collaborative group projects enable students to work together to investigate specific topics or problems related to petroleum chemistry. Group projects may involve literature reviews, data analysis, experimental design, and presentation of findings to the class or industry professionals. 5. Field Trips: Field trips when possible, to petroleum facilities, refineries, or research laboratories provide students with firsthand exposure to industry practices, technologies, and challenges. Field trips offer valuable insights into the practical applications of petroleum chemistry and foster connections between academic learning and real-world experiences. 6. Guest Lectures: Inviting guest speakers when possible, from industry, academia, or government agencies to deliver lectures or presentations on specialized topics enriches the learning experience and provides students with diverse perspectives and insights into current trends, research, and career opportunities in the field of petroleum chemistry. 7. Interactive Discussions: Interactive class discussions, debates, and Q&A sessions encourage active participation and critical thinking among students. Discussions may focus on controversial issues, emerging technologies, ethical considerations, or interdisciplinary connections in petroleum chemistry. 8. Online Resources: Supplemental online resources, such as multimedia presentations, interactive simulations, virtual labs, and web-based tutorials, provide additional opportunities for self-directed learning and exploration of complex topics in petroleum chemistry. 9. Assessments: Formative and summative assessments, including quizzes, exams, essays, laboratory reports, presentations, and projects, evaluate students' understanding of course material, critical thinking skills, and ability to apply knowledge to real-world situations. Feedback provided through assessments helps guide student learning and informs instructional practices.

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
Week 1-2:	2	**Introduction to Petroleum Chemistry** - Overview of the petroleum industry and its significance -Basic concepts in organic chemistry releva to petroleum -Introduction to hydrocarbons and petroleur products	**Introductio to Petroleu Chemistry**	Physical & online	Quiz & Exam
Week 3-4:	2	**Petroleum Formation and Reservoirs** -Geological processes involved in the formation of petroleum -Types of petroleum reservoirs and their characteristics -Exploration and drilling techniques in the petroleum industry	**Petroleu m Formatio n and Reservoir s**	Physical & online	Quiz & Exam
Week 5-6:	2	**Crude Oil Composition and Properties** -Chemical composition of crude oil and nat gas -Physical and chemical properties of hydrocarbons -Methods for analyzing crude oil compositic	**Crude Oil Composit ion and Propertie s**	Physical & online	Quiz & Exam
Week 7-8:	2	**Petroleum Refining Processes** -Overview of petroleum refining operations -Distillation and fractional distillation -Catalytic cracking, hydrocracking, and reforming processes	**Petroleu m Refining Processes**	Physical & online	Quiz & Exam
Week 9-10	2	**Refinery Products and Applications** -Classification and properties of petroleum products -Applications of fuels, lubricants, solvents, petrochemicals -Quality control and specifications for petroleum products	**Refinery Products and Applicati ons**	Physical & online	Quiz & Exam
Week 11-12:	2	**Environmental and Sustainability Aspec** -Environmental impact of petroleum extraction, refining, and utilization -Strategies for minimizing pollution and mitigating environmental risks. -Sustainable practices in the petroleum industry -Emerging Technologies and Future Trends	**Environme l and Sustainabil Aspects**	Physical & online	Quiz & Exam
			Innovation petroleum	Physical & online	Quiz & Exam

Week 13-14:	2	**Innovations in petroleum chemistry and refining technology** -Alternative fuels and renewable energy sources -Challenges and opportunities in the future of the petroleum industry	**chemistry a refining technology**		
Week 15:	2	**Review and Integration** -Review of key concepts and topics covered throughout the course -Integration of knowledge from lectures, laboratory work, and assignments -Preparation for final assessments and examinations	**Review and Integration**	Physical & online	Quiz & Exam

11 Course Evaluation

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

1. Daily Preparation: 5%
   - Attendance and active participation in class discussions and activities
   - Completion of assigned readings, homework, and pre-class exercises
2. Daily Oral Presentations: 5%
   - Participation in oral presentations, discussions, and debates during class
   - Ability to articulate and communicate ideas effectively.
3. Laboratory Work: 15%
   - Performance and participation in laboratory experiments and exercises
   - Accuracy of data collection, analysis, and interpretation
   - Quality of laboratory reports and documentation
4. Monthly or Written Exams: 10%
   - Assessments covering course material from lectures, readings, and laboratory work.
   - Quizzes, mid-term exams, or periodic written assessments
5. Reports and Assignments: 5%
   - Completion and submission of written assignments, research papers, or projects
   - Quality of content, analysis, organization, and presentation
6. Final Exam: 60%
   - Comprehensive assessment covering all course material.
   - Evaluation of knowledge retention, understanding, and application

12 Learning and Teaching Resources

Required textbooks (curricular books, if any)	(2022). Petroleum Chemistry. doi: 10.1201/9781003277354-1
Main references (sources)	(2022). The Chemistry of Oil and Petroleum Products. doi: 10.1515/9783110694529
Recommended books and references (scientific journals, reports...)	Shahryar, Jafarinejad. (2017). Introduction to the Petroleum Industry. doi: 10.1016/B978-0 12-809243-9.00001-8 Vladimir, N., Koshelev., V., D., Ryabov., Ravilya, Z., Safieva. (2000). Chemistry of petroleum hydrocarbons. Directions in resear

	Chemistry and Technology of Fuels and Oils, doi: 10.1007/BF02725255
Electronic References, Websites	Crude Oil Lesson 1 - Crude Oil, Hydrocarbon and Alkanes (youtube.com) Crude Oil Lesson 2 - Fractional Distillation (youtube.com) Crude Oil Lesson 3 - Cracking (youtube.com)

Course Description Form

1. Course Name: Pollution

2. Course Code:

3. Semester / Year: 2023-2024

4. Description Preparation Date: 21/3/2024

5. Available Attendance Forms: Class Attendance

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: Assist. Prof. Dr. Atheel Hassan Kadhim
Email: atheel.alwash@nahrain.univ.edu.iq

8. Course Objectives

Course Objectives	1 -Introducing students to the basic concepts of air, water and soil pollutants. 2-Give the student an accurate description of the causes of air, soil and water pollutants. 3- Giving the student an idea about reducing limiting the causes of water, air and soil pollutants.

9. Teaching and Learning Strategies

Strategy	- Providing students with the basics and additional topics related to thinking outcomes - Forming discussion groups during the lectures to discuss - Ask the students a set of thinking questions during the lectures such as what, how, when and why for specific topics - Giving students homework that requires self-explanations

10. Course Structure

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

1	2	Introduce students to the basic concepts of pollution	Definition of air, pollution, classification	data show	Oral and written exams
2	2	Introduce students to the basic concepts of pollution	Air pollution Acid Rain	data show	Oral and written exams
3	2	Introduce students to the basic concepts of pollution	Water pollution And its sources	data show	Oral and written exams
4	2	Introduce students to the basic concepts of pollution	Water pollution treatments by activated carbon and membrane	data show	Oral and written exams
5	2	Introduce students to the basic concepts of pollution	Water hardness and their removal methods, groundwater, sources	data show	Oral and written exams
6	2	Introduce students to the basic concepts of pollution	Mid exam	data show	Oral and written exams
7	2	Introduce students to the basic concepts of pollution	Soil Pollution	data show	Oral and written exams
8	2	Introduce students to the basic concepts of pollution	Examples of soil pollution and treatment method	data show	Oral and written exams
9	2	Introduce students to the basic concepts of pollution	Plastic Pollution	data show	Oral and written exams
10	2	Introduce students to the basic concepts of pollution	Photodegradation of plastic	data show	Oral and written exams
11	2	Introduce students to the basic concepts of pollution	Indoor pollution.	data show	Oral and written exams
12	2	Introduce students to the basic concepts of pollution	Mid Exam	data show	Oral and written exams
13	2	Introduce students to the basic concepts of pollution	Municipal waste	data show	Oral and written exams
14	2	Introduce students to the basic concepts of pollution	Recycling of waste	data show	Oral and written exams
15		Introduce students to the b concepts of pollution	Review sections of course		

11. Course Evaluation					
Distributing the score out of 100 according to the tasks assigned to the student such as daily preparation, daily oral, monthly, or written exams, reports .... etc 50 Score of the mid exams 25 Score for quizzes 15 interaction within the class 10 for home works					
12. Learning and Teaching Resources					
Required textbooks (curricular books, if ar					
Main references (sources)			Air pollution and its control (S.C. Bhati Pollution: Causes, Effects and Control (Roy Harrison).		
Recommended books and references (scientific journals, reports…)					
Electronic References, Websites			Different sources from internet		

Course Description Form

1 Course Name:
Mathematics

2 Course Code:
3 Semester / Year:
First / Second
4 Description Preparation Date:
2024
5 Available Attendance Forms:
Physical attendance
6 Number of Credit Hours (Total) / Number of Units (Total)
60 ours/ 4 Units
7 Course administrator's name (mention all, if more than one name)
Name: Dr. Fatimah Al-Taie Email: fatimah.altaie@nahrainuniv.edu.iq
8 Course Objectives

Course Objectives	• Learning the basic concepts of mathematics, application in reality, solution of ordinary differential equations with first-, and higher-order and their applications. In addition, different classes of ODEs are considered.

9 Teaching and Learning Strategies

Strategy	The learning and teaching strategy is presented by: Providing the students with a sufficient amount of mathematical terms and definitions by attending lectures and presenting on the whiteboard to connect the students with the lecturer to solve as many real-life applications as possible. The pdf lectures, homework, quizzes, and exercises are shared on Google Classroom.

10 Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-2	8	Introduction to DE'	Definition and classification of	lectures	

			Differential Equations (DE's)		
3-6	16	First-order DE's	Methods for solving fi order ODE's	lectures	
7-9	12	Higher DE's	The general form of higher-order DE's	lectures	
10-11	8	Homogeneous DE's	Definition and method on solving homo. DE's	lectures	
12-13	8	Nonhomogeneous DE's	Definition, properties, and methods of solvin non-homo. DE's	lectures	
14-15	8	Laplace transform	Definition/properties c Laplace transform and then using Laplace transformation in solv DE's	lectures	

- Course Evaluation

Pre-final exam: 40%
(Quizzes, homework: 10%, Mid-Exams 30%).

Final exam: 60%

Total: 100%

- Learning and Teaching Resources

Required textbooks (curricu books, if any)	Earl D. Rainville and Phillip E. Bedient, Elementary Differential Equations, Collier Macmillan Publishers, fifth Edition, New York, 1974.
Main references (sources)	**[1]** C. Henry Edwards and David E. Penney, Differential Equations and Linear Algebra, ser. Pearson International Edition, third edition. Pearson Education, United States of America, 2010. **[2]** William E. Boyce, and Richard C. DiPrima, Elementary Differential Equations and Boundary Value Problems, John Wiley and Sons, Inc. Seventh edition, United State of America. 2001
Recommended books and references (scientific journals, reports…)	Applications of ODE's
Electronic Referenc Websites	**1**- Google.com **2-** https://www.khanacademy.org/math/differential-equations