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

Academic Program Description Form for Colleges and Institutes
For the academic year 2024-2023

University: Basrah
Faculty/Institute: Science
Scientific Department: Chemistry
File Filling Date :

Signature:

Scientific Associate Name :
Prof. Dr. Alaa Hassan

Date:

Signature:

Head of Department Name:
a.Dr. Hadi Ziara

Date:

Check the file before
Division of Quality Assurance and University Performance
Name of the Director of the Quality Assurance and University Performance Division:
Date//
Signature

Approval of the Dean of the Faculty of Science

Prof. Dr. Majid Nouri Humoud

0

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Prof. Dr. Alaa Hassan	**a.Dr. Hadi Ziara**
Date:	**Date:**

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Academic Program Description

This academic program description provides a brief summary of the most important characteristics of the program and the learning outcomes expected of the student to achieve, proving whether he has made the most of the available opportunities. It is accompanied by a description of each course within the program

University of Basrah – College of Science	**1. Educational institution**
Department of Chemistry	**2. Scientific Department / Center**
Chemistry	**3. Name of academic or vocational program**
Bachelor	**4. Final Certificate Name**
Decisions	**5. Academic System: Annual / Decisions / Other**
RSC	**6. Accredited Accreditation Program**
Simplicity of laboratory equipment, lack of chemicals, shortage of laboratory equipment	**7. Other external influences**
2024	**8. History of the preparation of the description**

9. Objectives of the Academic Program

- **Preparing and graduating qualified cadres to work in the fields of various branches of chemistry .**
- **Conduct academic and applied scientific research in order to understand more broadly and develop appropriate solutions to related problems and institutions**
- **Enable students to know the basic information in chemistry according to the latest scientific developments in this vital field of science.**

10. Required Program Outcomes and Teaching, Learning and Assessment Methods

A-A Cognitive Objectives .

- **Access to information**
- **Discuss and compare information**
- **Conducting scientific reports and research**
- **Communication, collaboration and teamwork**

B- Skills objectives of the program:

- **The skill of obtaining scientific and electronic information**
- **The skill of academic writing for research and reports, discussing them and teamwork**
- **The skill of training on some modern and advanced scientific software such as computational chemistry**

Teaching and learning methods

- **Applying e-learning and distance education platforms and communicating with students to deliver scientific information remotely.**
- **Adopting curricula based on modern scientific sources.**
- **Using visual and in-kind illustrations and giving lectures in an interactive and video format and in pdf format.**

Scientific trips to the oil and medical sectors.

Evaluation methods

1. **Daily, monthly or final direct theoretical and practical exams and tests.**
2. **Electronic exams and tests.**
3. **Approving scientific reports and research related to the topics of various courses.**

C- Emotional and value goals:

- **Increasing the student's sense of patriotism by introducing him to scientific honesty, credibility, the importance of professional ethics in the field of work, the need to preserve state property and invest the country's materials in a way that serves the citizen and improves his way of living.**
- **Promote the spirit of teamwork through joint laboratory and scientific work of students.**

d. General and qualifying skills transferred (other skills related to employability and personal development).

- **Using English in some courses.**
- **Advanced Software Training**
- **Leadership training and teamwork.**
- **Training on managing and writing research projects in academic writing.**
- **Training on the use of some applications to write sources such as Mandali, as well as the use of PowerPoint in presenting their writings**

12. Program Architecture	**11.**
The first stage according to the course of Bologna	

Course Name in English	My morning teacher	Chapter	Number of Units	Rapporteur	t
Electronic structure of atom	Prof. Ali Jamil Hamid	First	ECTS6	Chem101	1.
Volumetric Analytical Chemistry	Mr Doctor Ali Abdul razzaq Abdul wahid Assoc. Prof. Ibrahim Mohammed Jassim Dr. Hoda Salem Khudair	First	EC7	Chem131	2.
Chemical Safety	Prof. Tahseen Ali Saki	First	ECTS4	Chem161	3.
Calculus	Assoc. Prof. Dr. Jihan Mohammed Khudair Eng. Hawra Haider Abdul Karim	First	ECTS5	Math101	4.
Cell Biology	Assoc. Prof. Taleb Abdel Majeed Ramadan	First	ECTS5	Bio103	5.
Python	Eng. Asma Aziz Jaber	First	ECTS3	UOB103	6.
			30	Total Units	7.

Course Name	My morning teacher	Chapter	Number of Units	Rapporteur	t
General physics	Dr. Riyad Manadi Ramadan	Second	ECTS5	Phys109	1.
Arabic Language	Assoc. Prof. Rabab Kamel Abdel Hassan	Second	ECTS2	UOB104	2.
Sport	Prof. Dr. Lafta Hamid Salman Dr. Buthaina Jamil Nassif	Second	ECTS2	UOBsci103	3.
Freedom and Democracy	Eng. Ashwaq Abdulhussain Massad	Second	ECTS2	UOB102	4.
Chemical Bonding	Prof. Majeed Yaqoub Yousef Prof. Dr. Ahmed Ali Sawadi	Second	ECTS6	Chem102	5.
Gravimetric Analysis	Dr. Khawla Sabih Barghal Assoc. Prof. Zuhair Ali Abdulnabi	Second	ECTS8	Chem132	6.
Math for chemistry students	Prof. Alaa Hassan Abdullah	Second	ECTS5	Math115	7.
			30	Total Units	

Second stage					
1	3	Chemistry of the elements represented	Compulsory Department	CHEM201	Second
1	3	Coordinate chemistry	Compulsory Department	CHEM202	Second

1	3	Organic Chemistry Aliphatic	Compulsory Department	CHEM211	Second
1	3	Aromatic Organic Chemistry	Compulsory Department	CHEM212	Second
1	3	Thermodynamics	Compulsory Department	CHEM221	Second
1	3	Electrochemistry	Compulsory Department	CHEM222	Second
	2	Biochemistry 1	Compulsory Department	CHEM242	Second
	3	Solving Differential Equations	Compulsory College	MATH214	Second
	3	MATLAB Apps	Compulsory College	H260	Second
	3	Concepts of freedom and democracy	Compulsory University	W201	Second
	3	Geochemistry	Compulsory College	C275	Second
Third stage					
1	3	Stereochemistry	Compulsory Department	CHEM313	Third
1	3	Mechanics of Organic Reactions	Compulsory Department	CHEM314	Third
1	3	Kinetic chemistry	Compulsory Department	CHEM321	Third
	3	Quantum chemistry	Compulsory Department	CHEM323	Third
1	3	Spectroscopic chemistry	Compulsory Department	CHEM324	Third
1	3	Biochemistry 2	Compulsory Department	CHEM342	Third
	3	Industrial Chemistry	Compulsory Department	CHEM351	Third
1	3	Polymer Chemistry	Compulsory Department	CHEM352	Third

	2	English	Compulsory Department	D301	Third
	2	Organometallic Chemistry	Optional Section	CHEM301	Third
	2	Heterocyclic chemistry	Optional Section	CHEM315	Third
	2	Photochemistry	Optional Section	CHEM325	Third
	2	Separation methods	Optional Section	CHEM334	Third
	2	Clinical Biochemistry	Optional Section	CHEM343	Third
	2	Oil and petrochemical technology	Optional Section	CHEM353	Third
	3	Green Chemistry	Optional Section	CHEM333	Third
	2	Nanoorganic Chemistry	Optional Section	CHEM302	Third
Fourth stage					
3	3	Organic Diagnostics	Compulsory Department	CHEM416	Fourth
3	3	Instrumental Chemistry	Compulsory Department	CHEM431	Fourth
	2	Research Project	Compulsory Department	CHEM490	Fourth
	2	Environmental awareness	Compulsory College	and 400	Fourth
3	3	Chemistry of transition elements	Optional Section	CHEM401	Fourth
	3	Selected Topics in Inorganic Chemistry	Optional Section	CHEM402	Fourth
	3	Chemistry of anhydrous solutions	Optional Section	CHEM403	Fourth
	3	Inorganic Life Chemistry	Optional Section	CHEM 404	Fourth
	3	Selected Topics in Organic Chemistry	Optional Section	CHEM417	Fourth

	3	Advanced Organic Chemistry	Optional Section	CHEM418	Fourth
	3	Advanced Magnetic Resonance	Optional Section	CHEM425	Fourth
	3	Nuclear Radiochemistry	Optional Section	CHEM426	Fourth
	3	Selected Topics in Physical Chemistry	Optional Section	CHEM427	Fourth
	3	Advanced Electrochemistry	Optional Section	CHEM428	Fourth
1	3	Electroanalytical Chemistry	Optional Section	CHEM432	Fourth
	3	Biotechnology	Optional Section	CHEM445	Fourth
	4	Introduction to Petrochemicals	Optional Section	CHEM454	Fourth
	3	Manufacture of polymers	Optional Section	CHEM455	Fourth
	3	Environmental chemistry and pollution	Optional Section	CHEM461	Fourth

13. Planning for personal development
1- Providing approved modern curricula. **2- Providing training opportunities in the various oil, medical and industrial sectors for the student.** **3- Adopting modern illustrative and visual methods.** **4- Holding self-development lectures in order to raise awareness and the ability to get rid of problems or find solutions to them.**
14. Admission criterion (setting regulations related to admission to a college or institute)
- Central admission – for morning studies **- Direct submission of evening studies - according to the rate and competition**
15. The most important sources of information about the program

The updated course system for the Department of Chemistry - College of Science - University of Basra for the year 2024-2023.

Course Description Form

Module Information

Module Title	**Electronic Structure of Atom**	**Module Delivery**	
Module Type	**Core**	☒ **Theory** ☒ **Lecture** ☐Lab ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**Chem101**		
ECTS Credits	**7**		
SWL (hr/sem)	**256**		
Module Level	1	**Semester of Delivery**	1
Administering Department	Type Dept. Code	**College**	Type College Code
Module Leader	Name	**e-mail**	E-mail
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	01/06/2023	**Version Number**	1.0

Relation with other Modules			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	Module Objectives Module 1: Introduction to Atomic Structure • Define the atom and identify its subatomic particles • Describe the Bohr model of the atom and its limitations • Explain the quantum mechanical model of the atom and its implications for electron behavior • Define the concept of an atomic orbital and describe the different types of orbitals Module 2: Atomic Orbitals and Electron Configurations • Apply the quantum numbers to describe atomic orbitals • Use the Aufbau principle to predict the electron configurations of atoms • Explain the relationship between electron configurations and the periodic table • Identify the valence electrons of an atom and explain their importance in chemical bonding Module 3: Electron Transitions and Emission and Absorption Spectra • Describe the process of electron excitation and de-excitation • Explain the relationship between electron transitions and emission and absorption spectra • Use line spectra to identify elements and determine their electron configurations Module 4: Periodic Trends in Electron Configurations and Properties • Identify the periodic trends in electron configurations and properties • Explain the relationship between electron configurations and the chemical and physical properties of elements Module 5: Applications of Electronic Structure • Describe the applications of electronic structure in chemistry, physics, and other fields • Discuss the importance of electronic structure in understanding the behavior of matter
Module Learning Outcomes	Module Learning Outcomes Module 1: Introduction to Atomic Structure • Upon completion of this module, students will be able to:

	• Define the atom and identify its subatomic particles • Describe the Bohr model of the atom and its limitations • Explain the quantum mechanical model of the atom and its implications for electron behavior • Define the concept of an atomic orbital and describe the different types of orbitals Module 2: Atomic Orbitals and Electron Configurations • Upon completion of this module, students will be able to: • Apply the quantum numbers to describe atomic orbitals • Use the Aufbau principle to predict the electron configurations of atoms • Explain the relationship between electron configurations and the periodic table • Identify the valence electrons of an atom and explain their importance in chemical bonding Module 3: Electron Transitions and Emission and Absorption Spectra • Upon completion of this module, students will be able to: • Describe the process of electron excitation and de-excitation • Explain the relationship between electron transitions and emission and absorption spectra • Use line spectra to identify elements and determine their electron configurations Module 4: Periodic Trends in Electron Configurations and Properties • Upon completion of this module, students will be able to: • Identify the periodic trends in electron configurations and properties • Explain the relationship between electron configurations and the chemical and physical properties of elements Module 5: Applications of Electronic Structure • Upon completion of this module, students will be able to: • Describe the applications of electronic structure in chemistry, physics, and other fields • Discuss the importance of electronic structure in understanding the behavior of matter Overall Module Learning Outcomes Upon completion of this module, students will be able to: • Understand the fundamental principles of the electronic structure of atoms • Apply their knowledge to predict the electron configurations of atoms and to explain the periodic trends in electron configurations and properties • Use their understanding of electronic structure to explain the chemical and physical properties of elements • Apply their knowledge of electronic structure to solve problems in chemistry, physics, and other fields These learning outcomes are aligned with the overall course objectives, and they will be assessed through a combination of homework assignments, quizzes, exams, and the final project. 1.
Indicative Contents	Indicative Contents of Modules Module 1: Introduction to Atomic Structure • Historical development of atomic models

	• The Bohr model of the atom • The quantum mechanical model of the atom • Atomic orbitals • Quantum numbers • Electron spin Module 2: Atomic Orbitals and Electron Configurations • The Aufbau principle • Pauli's exclusion principle • Hund's rule • Electron configurations of atoms • Valence electrons • Periodic table trends in electron configurations Module 3: Electron Transitions and Emission and Absorption Spectra • Excitation and de-excitation of electrons • Emission and absorption spectra • Line spectra • Quantum defects Module 4: Periodic Trends in Electron Configurations and Properties • Effective nuclear charge • Ionization energies • Electron affinities • Electronegativity • Atomic radii • Periodic table trends in these properties Module 5: Applications of Electronic Structure • Electronic structure and chemical bonding • Electronic structure and spectroscopy • Electronic structure and materials science • Electronic structure and other applications Please note that this is just an indicative list of topics that may be covered in each module. The specific content of each module may vary depending on the instructor and the textbook used.

Learning and Teaching Strategies	
Strategies	The learning and teaching strategy for the module on electronic structure of atoms should be designed to help students develop a deep understanding of the fundamental concepts and principles involved. The strategy should also be flexible enough to accommodate different learning styles and preferences. Here are some specific learning and teaching strategies that may be effective for this module:

Student Workload (SWL)			
Structured SWL (h/sem)	79	**Structured SWL (h/w)**	2
Unstructured SWL (h/sem)	165	**Unstructured SWL (h/w)**	1
Total SWL (h/sem)	**256**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction : Concentration Unit
Week 2	Concentration Unit
Week 3	Calculating of pH
Week 4	Calculating of pH
Week 5	Salts
Week 6	Buffer Solutions
Week 7	Mixture
Week 8	Mixture
Week 9	Titration Curve (SS+SB)
Week 10	Titration Curve (SS+WB)

Week 11	Titration Curve (WS+SB)
Week 12	Argentometric titration
Week 13	Mohr and Volhard Methods
Week 14	Redox Titration
Week 15	Extra Examples
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Introduction: Begin by introducing the basic concepts of atomic structure, such as the subatomic particles and the different types of atoms.
Week 2	Atomic models: Discuss the development of atomic models, from the Bohr model to the quantum mechanical model. Explain the strengths and weaknesses of each model.
Week 3	Quantum numbers: Introduce the quantum numbers that are used to describe atomic orbitals. Explain how these quantum numbers determine the energy and shape of orbitals.
Week 4	Atomic orbitals: Discuss the different types of atomic orbitals and their properties. Explain how electrons are distributed in orbitals according to the Aufbau principle, Pauli's exclusion principle, and Hund's rule.
Week 5	EXAM
Week 6	Electron configurations: Explain how to write electron configurations for atoms. Discuss the relationship between electron configurations and the periodic table. Part 1
Week 7	Electron configurations: Explain how to write electron configurations for atoms. Discuss the relationship between electron configurations and the periodic table. Part 2
Week 8	Electron transitions: Discuss the process of electron excitation and de-excitation. Explain how electron transitions give rise to emission and absorption spectra.
Week 9	Periodic trends: Discuss the periodic trends in electron configurations and properties. Explain how these trends can be explained by the quantum mechanical model of the atom.
Week 10	Exam
Week 11	Applications: Discuss the applications of electronic structure in chemistry, physics, and other fields. For example, students could learn about how electronic structure is used to explain the chemical bonding of elements or the properties of materials.

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Fundamental of analytical Chemistry	Yes
Recommended Texts		
Websites		

Grading Scheme Grading chart			
Group	**Grade**	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information					
Module Title	**Bonding chemistry**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒**Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**Chem102**				
ECTS Credits	7				
SWL (hr/sem)	125				
Module Level	UG3		**Semester of Delivery**	1	
Administering Department	Chem		**College**	UNI	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		

Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	01/06/2023	**Version Number**	1.0

Relation with other Modules			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1. Understand the structure and properties of chemicals at the atomic and molecular level. 2. Develop the basic concepts of chemical bonds and chemical reactions. 3. Enhance analytical skills and scientific thinking in the chemical context. 4. Develop the ability to apply chemical concepts in solving scientific problems. 5. Enhance knowledge of chemical processes in everyday and industrial life. 6. Promote awareness of the importance of chemistry in preserving the environment and developing environmentally friendly technologies. 7. Provide a strong base for exploring advanced branches of chemistry, such as organic chemistry, physical chemistry and analytical chemistry.
Module Learning Outcomes	1. Understand the fundamentals of atomic, molar and molecular chemistry. 2. Ability to interpret chemical bonds and understand the mechanisms of chemical reactions. 3. The ability to calculate atomic and molar masses and apply them in chemistry calculations. 4. Ability to analyze and interpret chemical data and experimental results. 5. The ability to apply chemical concepts in solving scientific problems. 6. Identify the different techniques and methods used in the study and analysis of chemistry. 7. Develop teamwork and scientific communication skills in the context of chemistry. 8. Learn about the practical applications of chemistry in multiple fields, such as industry, medicine, environment, agriculture, and others.

	9. Develop an understanding of ethical issues and professional responsibility in the practice of chemistry.
Indicative Contents	1. Learning Objectives: Outline the skills and concepts that students must achieve by the end of the course. 2. Content: Defines the topics and concepts that students should study throughout the course, and usually includes dividing topics into units or chapters. 3. Teaching and Assessment Methods: Includes methodologies and methods that will be used to deliver course content and assess student achievement. 4. Educational resources: These include textbooks, additional learning materials, science experiments, and digital resources needed to support the learning process. 5. Timeline and Academic Order: Determines the schedule of lessons, activities, and important dates for the course. 6. Additional guidance: May include tips for teachers on how to implement lessons effectively, and how to deal with the needs of different students

Learning and Teaching Strategies	
Strategies	1. . Interactive Learning: Students are encouraged to actively participate in educational processes, such as group discussions, collaborative learning, and group activities. 2. Practical learning: involves the use of practical experiments and activities to enhance students' understanding and apply theoretical concepts in reality. 3. Information and communication technology (TIC): Includes the use of interactive technologies and multimedia, such as tutorials and interactive media, to enhance interaction and assimilation. 4. Problem-based learning: involves asking real problems and challenges that students have to solve using the concepts and skills learned. 5. Self-learning and life skills: Encourages students to develop critical thinking, time management, problem-solving, and self-learning skills. 6. Collaborative Learning: Encourages students to work together in small groups to share knowledge, solve problems, and achieve common goals. 7. Self-paced learning: involves giving students the responsibility to set their personal goals, make plans to achieve them, and evaluate their progress. 8. Continuous evaluation and feedback: includes providing continuous feedback to students about their performance and achievement of educational goals, and identifying areas that need to be developed

Student Workload (SWL)			
Structured SWL (h/sem)	62	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	63	**Unstructured SWL (h/w)**	4
Total SWL (h/sem)	**125**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	5% (5)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	30% (30)	2 and 12	LO #3, #4, #5 and #6, #7
	Projects / Lab.				
	Report	1	5% (5)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Lewis Symbols and the Octet Rule
Week 2	Types of Chemical Bonding
Week 3	Comparison of Ionic and Covalent Compounds
Week 4	Electrovalent / Ionic Bonds
Week 5	Ionic Bonding
Week 6	Formation of Ionic Compounds
Week 7	Covalent Bonding
Week 8	Lewis Formulas for Molecules and Polyatomic Ions
Week 9	Formal Charges
Week 10	Polar and Nonpolar Covalent Bonds
Week 11	Dipole Moments
Week 12	molecular geometry
Week 13	valence bond theory

Week 14	orbital molecule theory
Week 15	review and exam
Week 16	

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1- General Chemistry: The Essential Concepts	yes
Recommended Texts	2- General Chemistry	Yes
Websites		

Grading Scheme			
Group	**Grade**	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information					
Module Title	**Volumetric Ananlysis**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**Analytical Chemistry**				
ECTS Credits	**6.60**				
SWL (hr/sem)	**256**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	

Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title		Professor	**Module Leader's Qualification**		Ph.D.
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name		Name	**e-mail**	E-mail	
Scientific Committee Approval Date		01/06/2023	**Version Number**		1.0

Relation with other Modules			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents **Module Objectives, Module Learning Outcomes and Indicative Contents**	
Module Objectives	1. To calculating concentrations of liquid and solid materials. 2. To calculating pH – value of Acid, Base, Salts, and others. 3. Study the hydrolysis of Salts. 4. To determination the percentage of Mixture. 5. Study the Argentometric titrations. 6. Study the Redox-Titrations. 7. Study the complex titrations.
Module Learning Outcomes	2. Learning of concentration unit : Molarity, Normality, ppm, %. 3. Learning how determine pH of Strong Acid, Strong Base, weak Acid, weak base, buffer solutions, salts and others. 4. Define the Kh of deferent types of salts. 5. Learning of precipitation titration (determination of %Chloride) and Mohr and Volhard methods. 6. Writing of redox equations. 7. Learning of EDTA titration and determination of Mg by comples titration.
Indicative Contents	Indicative content includes the following. Part A – Concertation. Part B – pH-value , Mixture Part C – Titration Curve. Part – D Titration of Silver , EDTA and Redox

Learning and Teaching Strategies	
Strategies	Give the principal of analytical chemistry, and imagining the subjects in laboratories in real work, and give many examples of calculations

Student Workload (SWL)			
Structured SWL (h/sem)	79	**Structured SWL (h/w)**	2
Unstructured SWL (h/sem)	165	**Unstructured SWL (h/w)**	1
Total SWL (h/sem)	**256**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction : Concentration Unit
Week 2	Concentration Unit
Week 3	Calculating of pH
Week 4	Calculating of pH
Week 5	Salts

Week 6	Buffer Solutions
Week 7	Mixture
Week 8	Mixture
Week 9	Titration Curve (SS+SB)
Week 10	Titration Curve (SS+WB)
Week 11	Titration Curve (WS+SB)
Week 12	Argentometric titration
Week 13	Mohr and Volhard Methods
Week 14	Redox Titration
Week 15	Extra Examples
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: prepration of liquid and solid
Week 2	Lab 2: Titration of carbonate
Week 3	Lab 3: Titration of Mixture 1
Week 4	Lab 4: Titration of Mixture 2
Week 5	Lab 5: Argentometric Titration
Week 6	Lab 6: Redox Titration
Week 7	Lab 7: Oral Exam

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Fundamental of analytical Chemistry	Yes
Recommended Texts		
Websites		

Grading Scheme			
Group	**Grade**	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings

	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information

Module Title	**Gravimetic Ananlysis**	**Module Delivery**	
Module Type	**Core**	☒ **Theory** ☒ **Lecture** ☒ **Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**Analytical Chemistry**		
ECTS Credits	**7.20**		
SWL (hr/sem)	**274**		

Module Level	1	**Semester of Delivery**	1
Administering Department	Type Dept. Code	**College**	Type College Code
Module Leader	Name	**e-mail**	E-mail
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	01/06/2023	**Version Number**	1.0

Relation with other Modules

Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents

Module Objectives	8. To calculating equilibrium constant. 9. To calculating Ksp.

	10. Study the Fundamental of Solubility. 11. Study the Size and Purity of Precipitate. 12. Study the organic Reagent. 13. Contamination of Precipitate
Module Learning Outcomes	8. Learning of equilibrium state. 9. Learning how determine Ksp. 10. Solubility of precipitate. 11. Purity and factor effecting precipitation. 12. Organic Reagents types and coordinations.
Indicative Contents	Indicative content includes the following. Part A – equilibrium constant Part B – Ksp Part C – Solubiltiy Part – organic Reagents

Learning and Teaching Strategies	
Strategies	Give the principal of Gravimetric analytical chemistry, and imagining the subjects in laboratories in real work, and give many examples of calculations

Student Workload (SWL)			
Structured SWL (h/sem)	94	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	180	**Unstructured SWL (h/w)**	1
Total SWL (h/sem)	**274**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All

	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Equilibrium constant
Week 2	Calculating of Ksp
Week 3	Factor Effecting Ksp
Week 4	Factor Effecting Ksp
Week 5	Solubility
Week 6	pH effect
Week 7	Temp. Effect
Week 8	Formation Constant
Week 9	Examples
Week 10	Contamination of Precipitate
Week 11	Removal of Contamination of Precipitate
Week 12	Types of precipitation
Week 13	Precipitation purity
Week 14	Organic Reagent
Week 15	Extra Examples
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	Lab 1: Water Content
Week 2	Lab 2: Determination of SO4=
Week 3	Lab 3: Determination of Nickel
Week 4	Lab 4: Determination of Iron
Week 5	Lab 5: Determination of Chloride
Week 6	Lab 6: Determination of calcium.

Week 7	Lab 7: Oral Exam

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Fundamental in Analytical Chemistry	yes
Recommended Texts		
Websites		

Grading Scheme			
Group	**Grade**	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information				
Module Title	**Bonding chemistry**		**Module Delivery**	
Module Type	**Core**		☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒Tutorial ☐ **Practical** ☐ **Seminar**	
Module Code	**Chem161**			
ECTS Credits	7			
SWL (hr/sem)	125			
Module Level	UG3		**Semester of Delivery**	1
Administering Department	Chem		**College**	UNI
Module Leader			**e-mail**	
Module Leader's Acad. Title			**Module Leader's Qualification**	
Module Tutor			**e-mail**	

Peer Reviewer Name		**e-mail**	
Scientific Committee Approval Date	01/06/2023	**Version Number**	1.0

Relation with other Modules			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	
Module Learning Outcomes	
Indicative Contents	

Learning and Teaching Strategies	
Strategies	

Student Workload (SWL)			
Structured SWL (h/sem)	62	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	63	**Unstructured SWL (h/w)**	4
Total SWL (h/sem)	**125**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	5% (5)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	30% (30)	2 and 12	LO #3, #4, #5 and #6, #7
	Projects / Lab.				

	Report	1	5% (5)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to chemical safety What is chemical safety? Why is chemical safety important?
Week 2	The different types of chemical hazards The risks associated with chemical exposure The principles of safe chemical management
Week 3	Chemical hazard classification Classifying chemicals according to their hazards
Week 4	Safety data sheets (SDSs) Interpreting the information on SDSs to identify potential hazards and risks
Week 5	Safe handling and storage of chemicals Implementing safe handling and storage procedures for chemicals
Week 6	Exam
Week 7	Selecting and using appropriate personal protective equipment (PPE) Chemical labeling and housekeeping
Week 8	Chemical emergency response Developing and implementing a chemical emergency response plan Responding to different types of chemical emergencies
Week 9	Communication and coordination during emergencies
Week 10	Chemical security The risks of chemical theft, loss, or diversion Security measures to protect chemicals
Week 11	Screening employees and visitors Tracking the movement of chemicals
Week 12	Additional topics Chemical safety legislation and regulations Chemical safety culture
Week 13	Continuous improvement in chemical safety and security
Week 14	Exam
Week 15	
Week 16	

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	3- General Chemistry: The Essential Concepts	yes
Recommended Texts	4- General Chemistry	Yes
Websites		

Grading Scheme			
Group	**Grade**	**Marks %**	**Definition**
Success Group (50 - 100)	**A** - Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

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Module Information					
Module Title				**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒Tutorial ☐ **Practical** ☐ **Seminar**	
Module Code	**Bio103**				
ECTS Credits					
SWL (hr/sem)	125				
Module Level	UG3		**Semester of Delivery**	1	
Administering Department	Chem		**College**	UNI	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	
Module Learning Outcomes	10.
Indicative Contents	7.

Learning and Teaching Strategies	
Strategies	

Student Workload (SWL)			
Structured SWL (h/sem)	62	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	63	**Unstructured SWL (h/w)**	4
Total SWL (h/sem)	**125**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	5% (5)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	30% (30)	2 and 12	LO #3, #4, #5 and #6, #7
	Projects / Lab.				
	Report	1	5% (5)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3 hr	50% (50)	16	All

Total assessment	100% (100 marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Lecture: Introduction to cell biology Tutorial: Cell theory and prokaryotic vs. eukaryotic cells Practical class: Introduction to microscopy
Week 2	Lecture: Introduction to cell biology Tutorial: Cell theory and prokaryotic vs. eukaryotic cells Practical class: Introduction to microscopy
Week 3	Lecture: Cell membranes and transport Tutorial: Structure and function of the cell membrane Practical class: Cell membrane transport experiments_1
Week 4	Lecture: Cell membranes and transport Tutorial: Structure and function of the cell membrane Practical class: Cell membrane transport experiments_2
Week 5	Exam
Week 6	Tutorial: Structure and function of the nucleus, mitochondria, and Golgi apparatus Practical class: Organelle isolation and identification
Week 7	Lecture: Organelles
Week 8	Lecture: Cell metabolism Tutorial: Energy production and storage in cells Practical class: Cell respiration and photosynthesis experiments
Week 9	Lecture: Cell signaling Tutorial: Intracellular and intercellular signaling pathways Practical class: Signal transduction experiments
Week 10	Lecture: Cell cycle and division Tutorial: Stages of the cell cycle and regulation Practical class: Mitosis and meiosis experiments
Week 11	Lecture: Cell differentiation and death Tutorial: How cells specialize and different types of cell death Practical class: Cell differentiation and death experiments
Week 12	Exam
Week 13	Revision lecture Revision tutorial Revision practical class
Week 14	
Week 15	
Week 16	

Learning and Teaching Resources		
	Text	**Available in the Library?**

Required Texts	5- General Chemistry: The Essential Concepts	yes
Recommended Texts	6- General Chemistry	Yes
Websites		

Grading Scheme			
Group	**Grade**	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information					
Module Title	**Calculus (1)**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒**Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**MATH-101**				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level	UG1		**Semester of Delivery**	1	
Administering Department	WHAT?		**College**	UNI	
Module Leader			**e-mail**		
Module Leader's Acad. Title			**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1- To provide students with a solid understanding of real numbers, functions, and their properties. 2- To introduce the concept of limits and continuity and develop the skills to evaluate them. 3- To explore the fundamental principles of differentiation and apply them to various functions. 4- To understand and apply Rolle's theorem and the mean value theorem in the context of calculus. 5- To develop the knowledge and techniques required for indefinite and definite integration. 6- To familiarize students with transcendental functions and their properties. 7- To equip students with different integration methods for solving a variety of problems. 8- To introduce the concept of improper integrals and their evaluation techniques.
Module Learning Outcomes	**By the end of this module, students should be able to:** 1- Demonstrate a clear understanding of real numbers, functions, and their properties. 2- Evaluate limits and analyze the continuity of functions. 3- Apply differentiation techniques to find derivatives of various functions. 4- Utilize Rolle's theorem and the mean value theorem to solve problems involving rates of change. 5- Solve problems involving indefinite and definite integrals. 6- Apply transcendental functions and their properties in problem-solving. 7- Utilize different integration methods to find antiderivatives. 8- Evaluate improper integrals and apply appropriate techniques for their solution.
Indicative Contents	1- Real numbers and their properties 2- Functions, including domain, range, and graphing 3- Limits and continuity 4- Differentiation and its applications 5- Rolle's theorem and the mean value theorem 6- Indefinite integrals and basic integration techniques 7- Definite integrals and their applications 8- Transcendental functions (such as exponential, logarithmic, and trigonometric functions)

	9- Integration methods (such as substitution, integration by parts, and partial fractions) 10- Improper integrals and their evaluation techniques

Learning and Teaching Strategies	
Strategies	1- Lectures to introduce and explain key concepts and techniques. 2- Class discussions and problem-solving sessions to enhance understanding. 3- Practical examples and applications to connect theory with real-world scenarios. 4- Group work and collaborative learning activities to promote active engagement. 5- Use of technology, such as graphing calculators and mathematical software, for visualization and analysis. 6- Homework assignments and practice exercises to reinforce learning. 7- Regular assessments and quizzes to gauge progress and provide feedback. 8- Office hours and individual consultations to address specific questions and concerns.

Student Workload (SWL)			
Structured SWL (h/sem)	62	**Structured SWL (h/w)**	4
Unstructured SWL (h/sem)	63	**Unstructured SWL (h/w)**	4
Total SWL (h/sem)	**125**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	5% (5)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	30% (30)	2 and 12	LO #3, #4, #5 and #6, #7
	Projects / Lab.				
	Report	1	5% (5)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to real numbers and their properties
Week 2	Functions: definition, domain, range, and basic operations
Week 3	Graphing functions
Week 4	Limits: definition and basic evaluation techniques
Week 5	Continuity of functions
Week 6	Intermediate value theorem
Week 7	Differentiation: definition, rules, and techniques Applications of differentiation
Week 8	Rolle's theorem and the mean value theorem
Week 9	Indefinite integrals and antiderivatives Basic integration techniques: power rule, substitution
Week 10	Definite integrals and their properties
Week 11	Transcendental functions: exponential, logarithmic, and trigonometric functions Integration techniques for transcendental functions
Week 12	Integration by parts
Week 13	Partial fractions decomposition
Week 14	Improper integrals: definition and convergence tests
Week 15	Techniques for evaluating improper integrals
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1- Calculus Tomas 1990	yes

	2- Calculus and Analytic Geomatry Thomas. G. B.4th 1984 3- Advanced Calculus and analysis MA 1002 Craw. I. 2000	
Recommended Texts	4- Calculus and Analytic Geometric Durfee. W.H 1971 New York	no
Websites		

Grading Scheme			
Group	**Grade**	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information					
Module Title	**Math for chemistry students**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐**Lab** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**Math115**				
ECTS Credits	**6.60**				
SWL (hr/sem)	**256**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	Type Dept. Code		**College**	Type College Code	
Module Leader	Name		**e-mail**	E-mail	
Module Leader's Acad. Title	Professor		**Module Leader's Qualification**	Ph.D.	
Module Tutor	Name (if available)		**e-mail**	E-mail	
Peer Reviewer Name	Name		**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	Understanding Fundamental Concepts: Define and comprehend fundamental concepts related to vectors and matrices. Demonstrate proficiency in vector operations, matrix operations, and the properties of vector spaces. Matrix Operations and Manipulations: Perform various matrix operations, including addition, scalar multiplication, and matrix multiplication. Understand the concept of the transpose and inverse of a matrix and apply them in computations. Determinants and Cramer's Rule: Compute determinants and understand their geometric and algebraic interpretations. Apply Cramer's rule to solve systems of linear equations. Vector Spaces and Subspaces: Identify vector spaces and subspaces, and understand their properties. Determine bases and dimensions of vector spaces.
Module Learning Outcomes	1. Demonstrate Proficiency in Matrix and Vector Operations: • Perform addition, scalar multiplication, and multiplication of matrices. • Understand the properties of vector spaces and apply vector operations. 1. Solve Systems of Linear Equations: • Apply matrix methods to solve systems of linear equations. • Utilize Gaussian elimination and matrix techniques for solving systems. 1. Apply Determinants and Cramer's Rule: • Compute determinants and interpret their geometric significance. • Apply Cramer's rule to solve systems of linear equations. 1. Understand Eigenvalues and Eigenvectors: • Define and compute eigenvalues and eigenvectors for matrices. • Apply diagonalization techniques to analyze linear transformations. 1. Analyze Linear Transformations: • Understand the concept of linear transformations and their matrix representations.

	• Analyze and interpret the kernel and range of linear transformations. 1. Work with Vector Spaces and Subspaces: • Identify and characterize vector spaces and subspaces. • Determine bases and dimensions of vector spaces. 1. Apply Linear Algebra in Real-World Contexts: • Solve practical problems in various fields using linear algebra concepts. • Understand applications in computer science, physics, engineering, and other disciplines. 1. Demonstrate Critical Thinking and Problem-Solving Skills: • Apply critical thinking skills to solve mathematical problems. • Tackle complex problems requiring creative problem-solving. 1. Communicate Mathematical Ideas Effectively: • Communicate mathematical concepts, solutions, and interpretations clearly. • Present findings from assignments and group projects. 1. Prepare for Advanced Studies: • Establish a solid foundation for more advanced coursework in mathematics, computer science, physics, engineering, and related fields.
Indicative Contents	**Module 1: Introduction to Vectors** 1. Definition and representation of vectors in 2D and 3D space 2. Cartesian and polar coordinates 3. Vector operations: addition, subtraction, scalar multiplication 4. Geometric interpretation of vectors 5. Unit vectors and vector magnitude 6. Vector spaces and their properties **Module 2: Matrices and Matrix Operations** 1. Definition and representation of matrices 2. Basic matrix operations: addition, subtraction, scalar multiplication 3. Matrix multiplication and its properties 4. Transpose and inverse of matrices 5. Solving systems of linear equations using matrices **Module 3: Determinants** 1. Definition and properties of determinants 2. Calculation of determinants for 2x2 and 3x3 matrices 3. Cramer's rule for solving systems of linear equations 4. Applications of determinants in geometry and linear algebra **Module 4: Vector Spaces and Subspaces** 1. Vector spaces: definition, examples, and properties 2. Subspaces and their characterization 3. Linear independence and dependence 4. Basis and dimension of vector spaces 5. Orthogonal vectors and Gram-Schmidt process **Module 5: Eigenvalues and Eigenvectors** 1. Definition and properties of eigenvalues and eigenvectors 2. Diagonalization of matrices 3. Applications of eigenvalues and eigenvectors in physics and engineering 4. Similarity transformations **Module 6: Linear Transformations** 1. Definition and properties of linear transformations

	2. Matrix representations of linear transformations 3. Kernel and range of linear transformations 4. Change of basis and similarity transformations 1. on the applications of linear algebra in various fields

Learning and Teaching Strategies	
Strategies	Contents: 1. Definition and Representation of Vectors 2. Vector Operations (Addition, Subtraction, Scalar Multiplication) 3. Vector Spaces and Properties 4. Linear Combinations and Span Teaching Strategies: • Conceptual Understanding: Use visual aids and real-world examples to help students grasp the conceptual foundations of vectors. • Hands-On Activities: Engage students in hands-on activities to perform vector operations and explore vector spaces. • Interactive Discussions: Encourage discussions on the geometric and algebraic interpretations of vectors.

Student Workload (SWL)			
Structured SWL (h/sem)	79	**Structured SWL (h/w)**	2
Unstructured SWL (h/sem)	165	**Unstructured SWL (h/w)**	1
Total SWL (h/sem)	**256**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Introduction to Vectors
Week 2	Introduction to Vectors
Week 3	Matrices and Matrix Operations
Week 4	Matrices and Matrix Operations
Week 5	Determinants
Week 6	Determinants
Week 7	Vector Spaces and Subspaces
Week 8	Vector Spaces and Subspaces
Week 9	Eigenvalues and Eigenvectors
Week 10	Eigenvalues and Eigenvectors
Week 11	Linear Transformations
Week 12	Linear Transformations
Week 13	review for all subjects
Week 14	review for all subjects
Week 15	Exam
Week 16	

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	Fundamental of analytical Chemistry	Yes
Recommended Texts		

Websites	

Grading Scheme			
Group	**Grade**	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information					
Module Title	**–General Physics**			**Module Delivery**	
Module Type	**Core**			☒ **Theory** ☒ **Lecture** ☐ **Tutorial** ☐ **Practical** ☐ **Seminar**	
Module Code	**PHY-109**				
ECTS Credits	**5**				
SWL (hr/sem)	**125**				
Module Level	**1**		**Semester of Delivery**	**1**	
Administering Department	**Type Dept. Code**		**College**	**Type College Code**	
Module Leader	**Dr. Riyadh Manadi Ramadan**		**e-mail**	**riyad.ramadhan@uobasrah.edu.iq**	
Module Leader's Acad. Title	**Tech.**		**Module Leader's Qualification**	**Ph.D.**	
Module Tutor	**Name (if available)**		**e-mail**	**E-mail**	
Peer Reviewer Name	**Name**		**e-mail**	**E-mail**	
Scientific Committee Approval Date	**16/1/2012**		**Version Number**		

Relation with other Modules			
Prerequisite module	**None**	**Semester**	
Co-requisites module	**None**	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	Expanding the student's awareness and preparing him to understand the principles of general physics and its most important foundations and the purpose for which this course was chosen to be a basic lesson in other relevant departments.
Module Learning Outcomes	Cognitive goals Introducing the student to the importance of physics being the basis of other sciences and making some of the curriculum vocabulary related to what he needs in his precise specialization while maintaining the physical privacy of the course, this is done in a series of theoretical lectures along the semester period of fifteen weeks, interspersed with some quick exams and monthly exams on which the student's endeavor is built . Emotional and value goals The ability to communicate information after presentation, discussion and interpretation Linking information to reality and the extent of its impact on different practical fields
Indicative Contents	The guiding content includes guiding and directing students on the importance of science and making it a measure of the progress of nations and praising the role of physics in the progress of this science and this is only necessary to adhere to the foundations and laws that ensure that the student reaches the highest ranks of science and knowledge.

Learning and Teaching Strategies	
Strategies	

	The most important education strategies are to seek to provide the student with the latest in the world and give a simplified idea of the importance of general physics (theoretically and practically) and open the way for dialogue and discussion, as well as asking questions and exercises to ensure serious participation for all without exception

Student Workload (SWL)			
Structured SWL (h/sem)	**60**	**Structured SWL (h/w)**	**4**
Unstructured SWL (h/sem)	**65**	**Unstructured SWL (h/w)**	**4**
Total SWL (h/sem)	**175**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	**2**	**5% (5)**	**5 and 10**	**LO #1, #2 and #10, #11**
	Assignments	**2**	**10% (10)**	**2 and 12**	**LO #3, #4 and #6, #7**
	Projects / Lab.			**Continuous**	**All**
	Report	**1**	**5% (5)**	**13**	**LO #5, #8 and #10**
Summative assessment	**Midterm Exam**	**2hr**	**20% (20)**	**7**	**LO #1 - #7**
	Final Exam	**3 hr**	**60% (60)**	**16**	**All**
Total assessment			**100% (100 marks)**		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	**Chapter One: General Introduction to Units, Dimensions, Physical Quantities and Units**
Week 2	**Chapter Two: Vectors, their types, the sum of the vectors, vector analysis, vector addition. Subtracting vectors**
Week 3	**Vector multiplication, numerical multiplication, vector product**
Week 4	**Exam (first and second semester)**
Week 5	**Chapter Three: Uniform Linear Motion, Distance, Displacement, Speed, Acceleration, Instantaneous Speed, Average Speed and Acceleration**

Week 6	**laws of linear motion, Newton's laws,**
Week 7	**Work, energy, staying moving, momentum .**
Week 8	**Chapter Four: Temperature, Temperature, Effect of Heat on Bodies, Thermometers**
Week 9	**Heat and energy, specific heat, heat quantity, heat transfer, thermal expansion**
Week 10	**Exam (Third and Fourth Semesters)**
Week 11	**Chapter Five: Light, Nature of Light Light Diffusion of Light Refractive Index of Light**
Week 12	**Light refraction, light reflection**
Week 13	**Chapter VI. Optical Devices, Simple Microscope Composite Microscope Camera**
Week 14	**Exam (Fifth and Sixth Semesters)**
Week 15	**Curriculum review and discussion**
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	
Week 9	

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	**Principles of General Physics (Dr. Aqeel Mahdi)**	**Yes**

Recommended Texts		**yes**
Websites		**yes**

Grading Scheme

Grading chart

Group	Grade	Marks %	Definition
Success Group (50 - 100)	**A - Excellent**	**90 - 100**	**Outstanding Performance**
	B - Very Good	**80 - 89**	**Above average with some errors**
	C - Good	**70 - 79**	**Sound work with notable errors**
	D - Satisfactory	**60 - 69**	**Fair but with major shortcomings**
	E - Sufficient	**50 - 59**	**Work meets minimum criteria**
Fail Group (0 – 49)	**FX – Fail**	**(45-49)**	**More work required but credit awarded**
	F – Fail	**(0-44)**	**Considerable amount of work required**

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Module Information

Module Title	**Introduction to Programming Principles with Python**	**Module Delivery**	
Module Type	**Core**	☒ **Theory** ☒ **Lecture** ☒ **Lab** ☒ **Tutorial** ☒ **Practical** ☐ **Seminar**	
Module Code	**Uob103**		
ECTS Credits	**8**		
SWL (hr/sem)	**200**		
Module Level	UGx11 1	**Semester of Delivery**	1
Administering Department	Pathological	**College**	Science
Module Leader		**e-mail**	
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.

Module Tutor	Name (if available)	**e-mail**	E-mail
Peer Reviewer Name	Name	**e-mail**	E-mail
Scientific Committee Approval Date	01/06/2023	**Version Number**	1.0

Relation with other Modules			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1. To develop problem solving skills and understanding of Principle of Computer Science and its Programming. 2. Introducing students to the computer and its hardware and software components and operating systems 3. Teaching students to use the Windows operating system 4. Teaching students to use application programs (Word, Excel, Access). 5. Introducing students to the Internet, how to benefit from it, and what capabilities it offers in education and knowledge 6. Introducing students to how to protect a computer from viruses
Module Learning Outcomes	1. Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks. 2. Recognize how computer work. 3. Learn how to work with computer. 4. Learn Python to quickly solve any problem in a scientific field. 5. identify, analyze, develop, implement, verify and document the requirements for a computing environment. 6. contribute to the diagnostics, troubleshooting, documenting and monitoring of technical problems using appropriate methodologies and tools. 7. implement and maintain secure computing environments. 8. Implement robust computing system solutions through validation testing that aligns with industry best practices. 9. communicate and collaborate with team members and stakeholders to ensure effective working relationships. 10. select and apply strategies for personal and professional development to enhance work performance. 11. Apply project management principles and tools when working on projects within a computing environment. 12. adhere to ethical, legal, and regulatory requirements and/or

Indicative Contents	Indicative content includes the following. • An ability to apply knowledge of basic science and engineering fundamentals • An ability to undertake problem identification, formulation and solution. • The capacity to solve problems, including the collection and evaluation of information [15 hrs] • The capacity for critical and independent thought and reflection

Learning and Teaching Strategies

Strategies	Type something like: 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.

Student Workload (SWL)

Structured SWL (h/sem)	109	**Structured SWL (h/w)**	7
Unstructured SWL (h/sem)	91	**Unstructured SWL (h/w)**	6
Total SWL (h/sem)	**200**		

Module Evaluation

As		**Time/ Number**	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	5 and 10	LO #1, #2 and #10,
	Assignments	2	10% (10)	2 and 12	LO #3, #4 and #6, #7
	Projects / Lab.	1	10% (10)	Continuou	All
	Report	1	10% (10)	13	LO #5, #8 and #10
	Midterm Exam	2hr	10% (10)	7	LO #1 - #7

Summative assessment	**Final Exam**	3 hr	40% (50)	16	All
Total assessment			100% (100		

Delivery Plan (Weekly Syllabus)	
Week	**Material Covered**
Week 1	Computer Basics: Introduction to Computers Hardware, Software and Memory The design of a computer, The design of a computer.
Week 2	Problem Solving and Software Development Process: Steps in solving a problem using a computer
Week 3 - 4	Problem Solving Tools: The difference between the various algorithm methods: Pseudocode and Flowchart, Sample problems and solution using the various methods of algorithm
Week 5	Programming Basics: Programming Languages, Compilers, and Interpreters, Writing, Compiling, and Running a Simple Python Program, Output statement in Python programming
Week 6	Data Types: Identifier, Variables and Constants Keywords
Week 7	Operators & Expression: Arithmetic, Logical, Assignment, Comparison, Bitwise, Increment and Decrement Operators
Week 8	Input / Output: Keyboard and Screen I/O
Week 9	Exam
Week 10 - 11	Flow of Control (Branching): *If* Statement, *F-Box The costume* Statement, if... If... else Statement, and Nested if Statements
Week 12 - 13	Flow of Control (Loops): While Statement, For Statement
Week 14 -15	Functions: Function Definition and Calling the Function, The return Statement and void Function
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus)	
Week	**Material Covered**
Week 2	Introduction to Problem Solving using Pseudo-code, Algorithm and Program Flowchart using **MS Visio**

Week 3	Introduction to python: Read, Write, compile and run a first Program in Python
Week 4	Variable: Types, Declare a variable (integer, long integer, double float) and initialize it.
Week 5	Variable: Types, Declare a variable (string, list, tuple) and initialize it.
Week 6	Types of Operator: Arithmetic Operators, Comparison Operators
Week 7	Types of Operator: Assignment Operators, Bitwise Operators
Week 8	Basic Concept and Syntax of Python Programming (Control statement – switch Statement)
Week 9	Basic Concept and Syntax of Python Programming (Control statement – loop statement)
Week 10	Basic Concept and Syntax of Python Programming (Array)
Week 11	Built-in Array Methods
Week 12	Basic Concept and Syntax of Python Programming (List)
Week 13	Built-in List Functions & Methods
Week 14	Basic Concept and Syntax of Python Programming (Functions)

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	We need a letter approved by the ministry	Yes
Recommended Texts	Think Python, Allen B. Downey, 2nd Edition, Released December 2015, Publisher(s): O'Reilly Media Inc., ISBN: 9781491939369	Yes
Websites	https://cdlsiet.ac.in/wp-content/uploads/2022/03/PYTHON-Lab-Manual.pdf	

Grading Scheme

Group	Grade	Marks %	Definition
Success Group (50 - 100)	**A** - Excellent	90 - 100	Outstanding Performance
	B - Very	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D -	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX** – Fail	(45-49)	More work required but credit
	F – Fail	(0-44)	Considerable amount of work

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Ministry of Higher Education and Scientific Research – Republic of Iraq

Publisher: University of Basrah

Faculty : Faculty of Science

Section:

College Logo

Semester : First

Academic Year : 2024-2023

CURRICULUM VOCABULARY: < ARABIC LITERATURE (DECISION S101) >

MOBILE NUMBER : 07704776126

Teaching Name: Dr. Rabab Hussein Mounir

Number of Lesson Units :2 **Official page link:** **https://faculty.uobasrah.edu.iq/portal/d6ef5f7fa914c19931a55bb262ec879c**	**Affiliation: College of Science - University of Basrah** **Official Email :** **rabab.muneer@uobasrah.edu.iq**

Overview

Course UOB 104 Core Subjects in Arabic Language and Literature
It develops the student's culture and language and helps him to overcome the mistakes he makes.

Goals and objectives

- ✓ Developing the student's linguistic and literary culture.
- ✓ Maintaining the integrity of the Arabic language.
- ✓ Developing the student's linguistic faculty.
- ✓ Treatment of spelling and grammatical errors and linguistic errors.
- ✓ Develop the student's ability to read and understand texts.

Sources

[1] Quran
[2]The foundations of literary criticism among the Arabs. Ahmed Ahmed Badawi
[3] Literary theory Austin Werne and René Wolk
3- Articles in Arabic. Mazen Mubarak
4- Mayor Ibn Rashiq

5- Grammar schools. Khadija Alhadithi
6- The issue of Islam and poetry. Adrys Naqouri
7 - Arabic philology Dr. Kased Yasser
8-Studies in Philology, Dr. Sobhi Saleh
9- Evidence of miracles, Abdul Qaher Al-Jurjani
10- Clear rhetoric, Ali Al-Jarem
11-The movement of modern Arabic poetry through its media in Syria, Dr. Ahmed Bassam
12- Explanation of Ibn Aqeel
13 The Mosque of Arabic Lessons - Mustafa Ghalayini
14- Clear spelling, Abdul Majeed Al Nuaimi

Approved Assessments

The grade of the subject (grade value) is distributed on the following aspects:

Grade	Details
Final exam score = 60	**Exams 20**

Quest score = 40	
	Degree of assimilation 10 **Participation 8** **Attendance 2**
	Overall score 40

Lesson description and allocation schedule

The lesson includes (2) hours - the number of weekly hours approved distributed over 15 weeks .

Exams & Assessments	Reading in the source	Subject	History	Week
	Foundations of literary criticism	The concept of literature		1
	Philology and Articles in Arabic	Religion and Arabic		2
	Studies in philology and the issue of Islam and poetry	Islam - poetry and the importance of Arabic sciences in understanding the text		3
	Clear rhetoric and image in Arabic poetry	Components of the literary text: 1- Language 2- Image		4
	The movement of Arabic poetry through its media	Components of the literary text: 3- Music 4- Construction and applications		5
		Number and its distinction		6
		First Month Test		7
		The primary hamza and the middle hamza and applications		8
		The hamza similar to the middle and the hamza is extremist and its enlightenment and applications		9
		Al-Daad and Al-Zaa		10
		Common linguistic errors		11
		The thousand elongated and compartment		12
		Sentences in Arabic		13
		Spelling notes		14
		Second Month Test		15
End of Semester Exam				

Is it possible to develop the < curriculum within the teaching authority of 20% > to include vocabulary that serves sustainability?	
1- Add new sources 2- Read new texts and apply what can be applied from the curriculum to them	**1- Yes, maybe within the axes.**

	2- I propose a topic that serves sustainability

Module Information					
Module Title	**Sports**			**Module Delivery**	
Module Type	**Supportive**			☒ **Theory** ☒ **Lecture** ☐ **Lab** ☒Tutorial ☒Practical ☐ **Seminar**	
Module Code	**UNI-103**				
ECTS Credits	2				
SWL (hr/sem)	50				
Module Level		UGx11 2	**Semester of Delivery**		1
Administering Department		Pathology	**College**	Science	
Module Leader			**e-mail**		
Module Leader's Acad. Title		Doctor	**Module Leader's Qualification**		
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date		01/09/2023	**Version Number**	1.0	

Relation with other Modules			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	9- Foundations and skills of sports activities 10- Foundations, principles, rules, and laws of games 11- Knowing the role of physical education and sports and health activities 12- Create a safe environment for the learner 13- Components of physical, health, and kinetic fitness 14- Designing educational activities 15- Communicating sports information and skills and verifying educational and sports goals
Module Learning Outcomes	**By the end of this module, students should be able to:** 9- Demonstrate a clear understanding of sports laws. 10- Evaluation and identification of sports injuries. 11- Applying basic skills in sports. 12- Knowledge of how to prepare a nutritional curriculum for athletes and non-athletes. 13- Knowing the psychological characteristics of individuals 14- Identify physical therapy devices. solution.
Indicative Contents	11- Introduction to sport history 12- Basketball history and law 13- Volleyball history and law 14- Futsal history and law 15- Sport rehabilitation 16- Sports psychology 17- Physical activity 18- Fitness 19- Sports injuries 20- Sports nutrition 21- Physical therapy

Learning and Teaching Strategies	
Strategies	1- Lectures to introduce and explain key concepts and techniques. 2- Class discussions and problem-solving sessions to enhance understanding. 3- Practical examples and applications 4- Group work and collaborative learning activities to promote active engagement.

	5-	Use of technology.
	6-	Homework assignments and practice exercises to reinforce learning.
	7-	Regular assessments and quizzes to gauge progress and provide feedback

Student Workload (SWL)			
Structured SWL (h/sem)	30	**Structured SWL (h/w)**	2
Unstructured SWL (h/sem)	20	**Unstructured SWL (h/w)**	1:30
Total SWL (h/sem)	**50**		

Module Evaluation					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	5% (5)	5 and 10	LO #1, #2 and #10, #11
	Assignments	2	30% (30)	2 and 12	LO #3, #4, #5 and #6, #7
	Projects / Lab.	1	10% (10)	15	
	Report	1	5% (5)	13	LO #5, #8 and #10
Summative assessment	**Midterm Exam**	2hr	10% (10)	7	LO #1 - #7
	Final Exam	2hr	40% (40)	16	All
Total assessment			100% (100 marks)		

Delivery Plan (Weekly Syllabus)	
	Material Covered
Week 1	Introduction to sport history
Week 2	Basketball history and law
Week 3	Volleyball history and law
Week 4	Futsal history and law
Week 5	Sport rehabilitation
Week 6	Sports psychology
Week 7	Exam

Week 8	Physical activity
Week 9	Fitness
Week 10	Sports injuries
Week 11	Sports nutrition
Week 12	Physical therapy
Week 13	Physical therapy
Week 14	Exam
Week 15	**Preparatory week before the final Exam**

Delivery Plan (Weekly field. Syllabus)	
	Material Covered
Week 12	Basic skills in basketball
Week 13	Basic skills in volleyball
Week 14	Basic skills in futsal
Week	
Week	
Week	
Week	

Learning and Teaching Resources		
	Text	**Available in the Library?**
Required Texts	1- BASCTBALL LAW 2- Volleyball Law 3- Futsal Law - Fives 4- Sports rehabiltaio 5- Sports psychology	Yes
Recommended Texts	1- Sport medicine	No
Websites		

Grading Scheme			
Group	**Grade**	**Marks %**	**Definition**
Success Group (50 - 100)	**A -** Excellent	90 - 100	Outstanding Performance
	B - Very Good	80 - 89	Above average with some errors
	C - Good	70 - 79	Sound work with notable errors
	D - Satisfactory	60 - 69	Fair but with major shortcomings
	E - Sufficient	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	(45-49)	More work required but credit awarded
	F – Fail	(0-44)	Considerable amount of work required

Note: Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.

Ministry of Higher Education and Scientific Research

Republic of Iraq

University: University Of Basrah

College: college of science

Department : depatrmentof biology

Year : 2024-2025 **Semester : First**

SYLLABUS: < ***BAATH PARTY CRIMES*** >

INSTRUCTOR: **Ashwaq Abdul-Hussain**	***Phone:****07725809349*
Hours: 3	***Office:*** **college of science**
Home Page: **https://faculty.uobasrah.edu.iq/portal**	***Email:*** **ashwaq.abdulhussain@uobasrah.edu.iq**

COURSE OVERVIEW

In the Baath Party crimes course, we will introduce the student to:

1- The concept of crimes and the most important types of international crimes

2- Knowing the crimes committed by the Baath regime during its rule.

3- Knowing the most important decisions issued by the Supreme Criminal Court

4- Introducing the student to the nature of the general conditions and their developments during that period.

5- Knowing the psychological and social effects left by the Baath regime.

6- Identifying the most important environmental crimes of the Baath regime in Iraq, including the destruction of cities and villages and the drying up of marshes, orchards, palm trees and trees.

GOALS AND OBJECTIVES

- The possibility of defining the concept of crimes, the most important sciences that dealt with it, and the types of international crimes
- Comparing the systems established in the curriculum with the current international systems. Giving life examples and linking them with the scientific material.
- Allow students to express their opinion on these crimes and the general situation at that time.

TEXTBOOK AND READINGS

1- A ministerial platform for the crimes of the Baath regime in Iraq.

COURSE ASSESSMENTS

The course grade (**40% though the course and 60% final exam**) will be based on the following elements:

	Points
Exams	60
Reading Checks	20
Participation	10
Attendance	10
Assignments	**100**

COURSE DESCRIPTION AND ASSIGNMENT SCHEDULE

This 30 -credit hour course is 15 weeks long. You should invest NO. hours every week in this course.

WK	DATE	TOPIC	READING	ASSIGNMENT
1		The concept of crimes and their types	Baath Party platform	
2		Definition of crime linguistically and idiomatically	Baath Party platform	
3		Crime departments	Baath Party platform	
4		Types of international crimes and the most important decisions issued by the Iraqi Criminal Court	Baath Party platform	
				Assignment 1
5		Psychological and social crimes and their effects	Baath Party platform	

6		Mechanisms of psychological crimes	Baath Party platform	
7		Violations of Iraqi laws and some of the most important decisions of political and military violations of the Baath regime	Baath Party platform	
8				Assignment 2
9		Environmental crimes of the Baath regime in Iraq	Baath Party platform	
10		Destruction of cities and villages	Baath Party platform	
11		Drying marshes, orchards, palm trees, trees and crop	Baath Party platform	
12				Assignment 3
13		Mass grave crimes	Baath Party platform	
14		Incidents of genocide graves committed by the Baathist regime in Iraq	Baath Party platform	
15	***Mid Exam***			

Is it possible to develop the curriculum <within the teaching authority 20%> to include vocabulary that serves sustainability	
1- Yes, it is possible (point an appropriate aspect)	**1**- Fighting poverty 2- No hunger 3- Developing life-long learning and education 4- Green chemistry 5- Sustainable development 6- Water purification 7- Water recycling for agriculture 8- Creativity and production -9- Sustainable energy (wind Sun and organic energy) -10- Environmental development- 11- pollution measurement -12- child care program-13- public health development program-14- measuring the efficiency of health institutions-15- gender equality-16- non-extremism-17- drug efficiency 18- Food efficiency for infants, children, adults and the elderly -19- Efficiency of the overall environment -20- Waste recycling-21- Heavy water disposal mechanisms-22- Literacy program-23- Mechanisms for preserving biodiversity-24- Mechanisms for spreading peace and justice in society- 25- Developing life in the seas and oceans-26- Studying the level of university education and the mechanisms for its development-27- Mechanisms for developing the local industry in Iraq-28- Mechanisms for developing infrastructure in Iraq-29-Reducing racial discrimination in all its forms-30-The basics of sustainable cities- 31- Mechanisms to reduce consumption and increase production- 32- Mechanisms to provide job opportunities for all-33-Study aspects of developing green areas-34- Study climatic phenomena in the country-35- Mechanisms for obtaining good health and well-being.
2- Suggest aspect that serves sustainability	

Ministry of Higher Education and Scientific Research – Republic of Iraq

Publisher : University of Basrah

Faculty : Faculty of Science

Semester : First

Academic Year : 2025-2024

CURRICULUM VOCABULARY : < BAATH PARTY CRIMES >

MOBILE NUMBER :07725809349	**Teaching Name : M.m Ashwaq Abdul hussain Massad**
Number of Lesson Units: 3	**Affiliation : College of Science**
Official page link : https://faculty.uobasrah.edu.iq/portal	**Official Email : ashwaq.abdulhussain@uobasrah.edu.iq**

Overview

In the Baath Party Crimes course, we will introduce the student to:

1- The concept of crimes and the most important types of international crimes
2- Know the crimes committed by the Baath regime during its rule.
3- Know the most important decisions issued by the Supreme Criminal Court
4- Introducing the student to the nature of the general situation and its developments during that period.
5- Know the psychological and social effects left by the Baath regime.
6- Identify the most important environmental crimes of the Baath regime in Iraq, including the destruction of cities and villages and the drying of marshes, orchards, palms and trees.

Goals and objectives

The possibility of defining the concept of crimes and the most important sciences that dealt with it and the types of international crimes

Comparing the systems installed in the curriculum with the current international systems, giving life examples and linking them with the scientific material.

Allow students to express their opinion on these crimes and the general situation at that time.

Sources

1. A ministerial platform for the crimes of the Baath regime in Iraq.

Approved Assessments

The grade of the subject (40% pursuit and 60% final exam) is distributed on the following aspects:

Grade	Details
60	**Exams**
20	**Degree of assimilation**
10	**Participation**
10	**Attendance**
100	**Total Grade**

Lesson description and allocation schedule

The lesson includes (30) hours - the number of weekly hours approved distributed over 15 weeks .

Exams & Assessments	Reading in the source	Subject	History	Week
	Baath Party Curriculum	The concept of crimes and their divisions		1
	Baath Party Curriculum	Definition of crime linguistically and idiomatically		2
	Baath Party Curriculum	Crime Sections		3
	Baath Party Curriculum	Types of international crimes and the most important decisions issued by the Iraqi Criminal Court		4
Exam 1				5
	Baath Party Curriculum	Psychological and social crimes and their effects		6
	Baath Party Curriculum	Mechanisms of psychological crimes		7
	Baath Party Curriculum	Violations of Iraqi laws and the most important decisions of political and military violations of the Baath regime		8
Exam 2				9
	Baath Party Curriculum	Environmental crimes of the Baath regime in Iraq		10

	Baath Party Curriculum	Destruction of towns and villages		11
	Baath Party Curriculum	Drainage of marshes, orchards, palms, trees and plantings		12
Exam 3				13
	Baath Party Curriculum	Mass grave crimes		14
	Baath Party Curriculum	The events of the genocide graves committed by the Baathist regime in Iraq		15
End of Semester Exam				

Is it possible to develop the < curriculum within the teaching authority of 20% > to include vocabulary that serves sustainability?	
1- Fighting poverty-2- No to hunger-3- Developing lifelong learning and teaching- 4- Green chemistry- 5- Sustainable development-6- Water purification-7- Water recycling for agriculture-8- Creativity and production-9- Sustainable energy (wind, sun, organic energy)-10- Environmental development- 11- Pollution Measurement -12- Child Care -13- Public Health Development-14- Measuring the efficiency of health institutions-15- Gender Equality-16- Non-extremism-17- Drug efficiency-18- Food efficiency for infants, children, adults and the elderly-19- Efficiency of the university environment-20- Waste recycling -21- Mechanisms for the disposal of Heavy Water-22- Literacy -23- Mechanisms for preserving biodiversity -24- Mechanisms for spreading peace and justice in society - 25- Developing life in the seas and oceans-26- Studying the level of university education and mechanisms of its development-27- Mechanisms for developing local industry in Iraq-28- Mechanisms for developing infrastructure in Iraq-29- Reducing racial discrimination in all its forms30-Basics of sustainable cities-31- Mechanisms to reduce consumption and increase production-32- Mechanisms to provide job opportunities for all-33- Study aspects of green space development -34- Study of climatic phenomena in the country -35- Mechanisms of obtaining good health and well-being.	**3- Yes, maybe within the axes.**
	4- I propose a topic that serves sustainability

- Compulsory college requirements:

Of which (23) units are required, all of which are required

: Compulsory Section:

Grader	on	nun	and	Material Name	Article Number
CHEM102	3	3	4	Chemistry of the elements represented	CHEM201
CHEM201, CHEM132	3	3	4	Coordinate chemistry	CHEM202
	3	3	4	Organic Chemistry	CHEM211
CHEM211	3	3	4	Aromatic Organic	CHEM212
C101, Wed115	3	3	4	Thermodynamics	CHEM221
CHEM221	3	3	4	Electrochemistry	CHEM222
C211 ,K 112	0	2	2	Biochemistry 1	CHEM242
CHEM212	3	3	4	Stereochemistry	CHEM313
CHEM313	3	3	4	Mechanics of Organic Reactions	CHEM314
CHEM222	3	3	4	Kinetic chemistry	CHEM321
C222, MR214	0	3	3	Quantum chemistry	CHEM323
CHEM323	3	3	4	Spectroscopic chemistry	CHEM324
CHEM242	3	2	3	Biochemistry 2	CHEM342
CHEM212	0	2	2	Industrial Chemistry	CHEM351
CHEM212	3	3	4	Polymer Chemistry	CHEM352
CHEM314	6	3	5	Organic Diagnostics	CHEM416
100 Units	3	3	4	Instrumental Chemistry	CHEM431
100 Units	2		2	Research Project	CHEM490

- Optional section:

Available (58) units and required (26) optional units

Grader	M	on	nun	and	Material Name	Article Number
CHEM202		0	2	2	Organometallic Chemistry	CHEM301
CHEM202		0	2	2	Nanoorganic Chemistry	CHEM302

CHEM212		**0**	**2**	**2**	**Heterocyclic chemistry**	**CHEM315**
CHEM321		**0**	**2**	**2**	**Photochemistry**	**CHEM325**
CHEM202		**0**	**2**	**2**	**Separation methods**	**CHEM334**
CHEM202		**0**	**3**	**3**	**Green Chemistry**	**CHEM333**
CHEM342		**3**	**2**	**3**	**Clinical Biochemistry**	**CHEM343**
CHEM351		**3**	**2**	**3**	**Petroleum Chemistry and Technology**	**CHEM353**
CHEM351		**0**	**2**	**2**	**Industrial applications**	**CHEM354**
CHEM202		**3**	**3**	**4**	**Chemistry of transition elements**	**CHEM401**
CHEM202		**0**	**3**	**3**	**Selected Topics ((Inorganic))**	**CHEM402**
CHEM202		**0**	**3**	**3**	**Chemistry of anhydrous solutions**	**CHEM403**
CHEM202		**0**	**3**	**3**	**Inorganic Biochemistry**	**CHEM404**
CHEM314		**0**	**3**	**3**	**Selected Topics in Organic Chemistry**	**CHEM417**
CHEM314		**0**	**3**	**3**	**Advanced Organic Chemistry**	**CHEM418**
CHEM324		**0**	**3**	**3**	**Advanced Magnetic Resonance**	**CHEM425**
CHEM324		**0**	**3**	**3**	**Nuclear Radiochemistry**	**CHEM426**
CHEM324		**0**	**3**	**3**	**Selected Topics ((Physics))**	**CHEM427**
CHEM222		**0**	**3**	**3**	**Advanced Electrochemistry**	**CHEM428**
CHEM222		**3**	**3**	**4**	**Electroanalytical Chemistry**	**CHEM432**
CHEM342		**0**	**3**	**3**	**Selected Topics ((Life))**	**CHEM444**
CHEM342		**0**	**3**	**3**	**Biotechnology**	**CHEM445**
CHEM351		**0**	**3**	**3**	**Introduction to petrochemical industries**	**CHEM454**
CHEM352		**3**	**2**	**3**	**Manufacture of polymers**	**CHEM455**
CHEM352		**0**	**3**	**3**	**Industrial Chemical Additives**	**CHEM456**
CHEM351		**0**	**3**	**3**	**Industrial Pollution Chemistry**	**CHEM451**

100 Units		2	2	3	Computational Chemistry	CHEM460

Available (58) units and required (26) optional units

Grader	o n	n u n	and	Material Name	Article Number
CHEM202	0	2	2	Organometallic Chemistry	CHEM301
CHEM212	0	2	2	Heterocyclic chemistry	CHEM315
CHEM321	0	2	2	Photochemistry	CHEM325
CHEM202	0	2	2	Separation methods	CHEM334
CHEM202	0	3	3	Green Chemistry	CHEM333
CHEM342	3	2	3	Clinical Biochemistry	CHEM343
CHEM351	3	2	3	Petroleum Chemistry and Technology	CHEM353
CHEM351	0	2	2	Industrial applications	CHEM354
CHEM202	3	3	4	Chemistry of transition elements	CHEM401
CHEM202	0	3	3	Selected Topics in Inorganic Chemistry	CHEM402
CHEM202	0	3	3	Chemistry of anhydrous solutions	CHEM403
CHEM202	0	3	3	Inorganic Biochemistry	CHEM404
CHEM314	0	3	3	Selected Topics in Organic Chemistry	CHEM417
CHEM314	0	3	3	Advanced Organic Chemistry	CHEM418
CHEM324	0	3	3	Advanced Magnetic Resonance	CHEM425
CHEM324	0	3	3	Nuclear Radiochemistry	CHEM426
CHEM324	0	3	3	Selected Topics in Physical Chemistry	CHEM427

CHEM222	**0**	**3**	**3**	**Advanced Electrochemistry**	**CHEM428**
CHEM222	**3**	**3**	**4**	**Electroanalytical Chemistry**	**CHEM432**
CHEM342	**0**	**3**	**3**	**Selected Topics in Biochemistry**	**CHEM444**
CHEM342	**0**	**3**	**3**	**Biotechnology**	**CHEM445**
CHEM351	**0**	**3**	**3**	**Introduction to petrochemical industries**	**CHEM454**
CHEM352	**3**	**2**	**3**	**Manufacture of polymers**	**CHEM455**
CHEM352	**0**	**3**	**3**	**Industrial Chemical Additives**	**CHEM456**
CHEM351	**0**	**3**	**3**	**Industrial Pollution Chemistry**	**CHEM451**

Note: Not all of the above electives may be available in each semester. Registration for the available courses.

Key shortcuts : (n) theoretical number of hours
(p) Number of working hours

Graduation Requirements for Students of the Department of Chemistry

Units	Requirements University	Requirements College	Compulsory section	Level School
37	6	15	15	First
37	3	8	26	Second
30	2	-	28	Third
13	2	-	11	Fourth
117	13	24	80	Total
26	-	-	-	Optional Section
143	-	-	-	Graduation Modules

Important Notes:

1- What is meant by the level is that the student has the right to register on the course if he collects the units required to complete the level and shown below:

First level: 0-37 units, second level: 37-74 units

Third level: 74-109 units, fourth level: 109-143

2- The student is not entitled to register for a course unless he successfully completes passing the preparatory course.

3- The subject that has two preludes must be successfully completed before registering for it.

4- The material that is not preliminary and is not limited to a level that can be taken at any time

Curriculum Skills Outline																		
Learning outcomes required from the program																		
General and qualifying skills transferred (Other skills related to employability and personal development)				Emotional and value goals				Program Skills Objectives				Cognitive Objectives				fundamental Or optional	Course Name	Year/Level
D4	D3	D2	D1	C4	C3	C2	C1	B4	B3	B2	B1	A4	A3	A2	A1			
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Electronic structure of the atom	The first The first
																Compulsory	Chemical synergy	

																Department		
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Volumetric analysis	The first
																Compulsory Department	Gravimetric analysis	
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory College	General Principles of Physics	The first

		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory College	Calculus 1	First
																Compulsory College	Mathematics for Chemistry	
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory College	Programming in Basic	The first
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory College	sport	The first
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory College	Arabic language	The first

			X	X		X	X	X		X	X	X	X	X	X	X	Compulsory College	Principles of Human Rights		The first
			X	X		X	X	X		X	X	X	X	X	X	X	Compulsory College	Chemical Safety & Security		The first
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Chemistry of the elements represented	CHEM 201		Second
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Coordinate chemistry	CHEM 202		Second

		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Organic Chemistry Aliphatic	CHEM 211	Second
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Aromatic Organic Chemistry	CHEM 212	Second
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Thermodynamics	CHEM 221	Second
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Electrochemistry	CHEM 222	Second

		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Biochemistry 1	CHEM 242	Second
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory College	Solving Differential Equations	MATH 214	Second
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory College	MATLAB Apps	H260	Second
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory University	Concepts of freedom and democracy	W201	Second
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory College	Geochemistry	C275	Second

		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Stereochemistry	CHEM 313	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Mechanics of Organic Reactions	CHEM 314	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Kinetic chemistry	CHEM 321	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Quantum chemistry	CHEM 323	Third

		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Spectroscopic chemistry	CHEM 324	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Biochemistry 2	CHEM 342	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Industrial Chemistry	CHEM 351	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Polymer Chemistry	CHEM 352	Third

		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	English	D301	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Organometallic Chemistry	CHEM 301	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Heterocyclic chemistry	CHEM 315	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Photochemistry	CHEM 325	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Separation methods	CHEM 334	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Clinical Biochemistry	CHEM 343	Third

		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Oil and petrochemical technology	CHEM 353	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Green Chemistry	CHEM 333	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Nanoorganic Chemistry	CHEM 302	Third
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Organic Diagnostics	CHEM 416	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Instrumental Chemistry	CHEM 431	Fourth

		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory Department	Research Project	CHEM 490	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Compulsory College	Environmental awareness	and 400	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Chemistry of transition elements	CHEM 401	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Selected Topics in Inorganic Chemistry	CHEM 402	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Chemistry of anhydrous solutions	CHEM 403	Fourth

		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Inorganic Life Chemistry	CHEM 404	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Selected Topics in Organic Chemistry	CHEM 417	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Advanced Organic Chemistry	CHEM 418	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Advanced Magnetic Resonance	CHEM 425	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Nuclear Radiochemistry	CHEM 426	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Selected Topics in Physical Chemistry	CHEM 427	Fourth

		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Advanced Electrochemistry	CHEM 428	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Electroanalytical Chemistry	CHEM 432	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Biotechnology	CHEM 445	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Introduction to Petrochemicals	CHEM 454	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Manufacture of polymers	CHEM 455	Fourth
		X	X		X	X	X		X	X	X	X	X	X	X	Optional Section	Environmental chemistry and pollution	CHEM 461	Fourth

University of Basrah

College of Science

Dept. of Chemistry

Description of graduates in the Faculty of Science / Department of Chemistry

Scope of work	Job classification	Graduate Description	Years of study and certificate awarded
Ministry of Higher Education and Scientific Research	Academic work	Research Assistant (Eng. Researcher)	4 years (Bachelor of Science)
Ministry of Health and Environment Oil Ministry Ministry of Water Resources Ministry of Education Ministry of Industry including: Pharmaceutical companies and laboratory materials manufacturing companies.	State Ministries	Chemical Assistant	

University of Basrah

College of Science

Department of Chemistry

Academic Program Description

Description of the courses of the Department of Chemistry

CHEM201 Elements represented in the periodic table where elements study their existence, general characteristics and interactions

Curriculum K 201

1- Elements represented

Position in the periodic table – Cyclicity of traits – Ionization energy – Electron affinity – Electronegativity – Atomic radius – Covalent radius – Metallic traits

2- Hydrogen and hydrides

Its existence, general characteristics and interactions - Hydrogen isotopes - Its production in industry and its uses - Hydrogen isomers (ortho and para hydrogen) - Hydrides and their types - Structure - Hydrides of group elements

3- Alkaline elements

General characteristics - preparation - presence - halides - oxides - hydrides - sulfates - similarity between lithium and magnesium .

4- Alkaline earthy elements

General characteristics - preparation - presence - halides - oxides - hydrides - similarity between beryllium and aluminum .

5- Boron and aluminum group

Introduction – Preparation and Qualities – Halides – Oxides – Alum – Hydrides – Complexes – Nitrogenous compounds of boron

6- Carbon and silicon group

Elements and their characteristics - halides - carbides - oxides - hybridization - elements of germanium, tin and lead - their qualities and preparation and the most important compounds and uses.

7- Oxygen and sulfur group (galcogens)

Characteristics of the elements, their presence and methods of obtaining them - the most important compounds - oxides, peroxides and peroxides .

8- Halogen group

Introduction – Presence – Separation Methods – Characteristics – Halogen and Oxyhalogen Acids – Their Compounds

9- Noble gas group

General characteristics – compounds – uses

10- Parity

The importance of symmetry in chemistry - symmetry processes - examples

Sources :

1- Comparative Inorganic Chemistry and Composition - translated by Dr. Mahdi Naji Al-Zakom

2- Chemistry of the elements represented d. Mahdi Naji Al-Zakum and Dr. Kazem Al-Obaidi

3- Basic Inorganic Chemistry (Part 1) translated by Dr. Mahdi Naji Al-Zakom.

CHEM202 / Chemistry Coordination: Teaching the student the shapes and characteristics of complexes according to scientific theories.

Curriculum CHEM202

1- Introduction to transitional elements

2- Introduction to the emergence of theories of synergy

3- Naming complex compounds

4- Crystal field theory

Dichotomy of d orbitals for different symmetry preparation – crystalline field stability energy of high twist and low twist complexes

5- Valence Theory – Hybridization of Atomic Orbitals

6- Lycandy field theory

7- Orbital molecular theory

8- A comparison of the success and inadequacy of theories of contemporaneity

9- Spectral and magnetic properties of complex compounds

10- Stereochemistry of complex compounds of symmetry numbers 4 and 6

11- **Preparation and reactions of complex compounds**

12- **Carbonyl compounds**

Preparation – interactions – properties

Sources

1- **Coordinated Chemistry Written by Dr. Essam Zarzis Salloumi**

2- **The Chemistry of Transition Elements - written by Dr. Mahdi Naji Al-Zakum**

3- **Coordinated Chemistry - written by Yaslow and Johnson - translated by Dr. Ali Falih Ajam**

4- **Basic inorganic chemistry by Cotton and Wilkinson**

CHEM211 / Organic Chemistry: Introducing students to the chemistry of hydrocarbons, especially organic aliphatic and their derivatives such as alcohols, aldehydes, ketones, carboxylic acids, amines, etc., as well as the course gives an overview of the importance of each of these varieties, their interactions, properties, methods of preparation and their industrial or biological importance.

Curriculum 211

1- **Structure and properties of the carbon atom**

2- **Alkanes – Cyclic alkanes**

3- **Alkenes – Nomenclature**

4- **Alkynes – nomenclature and geometric similarity**

5- **Dines - Types - Add 1, 4**

6- **Alkyl halides**

7- **Alcohol**

8- **Ethers**

9- **Aldehydes and ketones**

10- **Carboxylic acids – acids**

11- **Carboxylic acid derivatives – their effectiveness**

Halides Acids – Hydrides – Esters – Amides

12- **Amines**

The above vocabulary includes naming – preparation methods – interactions

Sources

1- **Organic chemistry by Roberts Stewert and Casiro**

2- **Organic chemistry by Morrison and Boyed**

3- **Intensive Introduction to Organic Chemistry - translated by Dr. Fadel Kamouna and Dr. Iqbal Al-Shaibani**

4- **Organic Chemistry translated by Raad Al-Hamdani and Ismail Bassiouni**

5- **A comprehensive look at organic chemistry translated by Muhammad Nizar**

6- **Fundamentals of Organic Chemistry by Dr. Qais Atwan Sharif**

C212 / Aromatic organic chemistry: Organic chemistry in general is concerned with the study of compounds inside and outside the body of the organism and therefore called organic and most of the compounds in the ground of plants and animals are organic and a large part of them aromatic compounds found in crude oil and some plants. Therefore, the student's study of these compounds in terms of isolation or preparation and interactions gives an understanding of the existence of these compounds and their importance in terms of some of them are drugs such as paracetol and some in the manufacture of perfumes and dyes.

Curriculum CHEM212

1- **Comparison of Benzene to Alkenes – Stability of Aromatic Benzene Compounds**

2- **Chemistry of benzene and its derivatives – nomenclature – physical and chemical properties**

3- **Electrolytic aromatic prostheses**

Halogenation – sulfonation – nitrification – alkylation – fluidity – compensator guidance

4- **Arinat**

4-1 - Chemistry of aryl halides

4-2 - chemistry phenols and quinones

4-3 - Chemistry of sulfonic acids and carboxylic acids

4.4 Chemistry of aldehydes, ketones and alcohols

4.5 Chemistry of nitrogen compounds

4-6- Derivatives of lateral chain aromatic compounds

4-7 - Chemistry of aromatic compounds with more than one ring benzene

4-8- Introduction to chemistry of heterocyclic compounds

4-9- Acidic and basic aromatic organic compounds

Sources

1- **Organic chemistry by Roberts Stewert and Casiro**

2- **Organic chemistry by Morrison and Boyed**

3- **Aromatic chemistry by Warning**

4- **Intensive Introduction to Organic Chemistry - translated by Fadel Kamouna and Iqbal Al-Shaibani**

5- **Organic Chemistry translated by Raad Al-Hamdani and Ismail Bassiouni**

6- **A comprehensive look at organic chemistry translated by Muhammad Nizar**

7- **Fundamentals of Organic Chemistry by Qais Atwan Sharif**

CHEM221 / Thermodynamics: Study of the relationships between heat, labor, temperature and energy. The laws of thermodynamics describe how energy changes in a system and whether a system can perform useful work with its surroundings.

Curriculum C221

The first law of thermodynamics

1- **Introduction – Modular System SI- Properties of systems - chemical thermodynamics - terms used in thermodynamics: standard state, thermodynamic system and its surroundings, state of thermodynamic system, system variables, thermodynamic functions .**

2- **Reversible and non-reversible and automated operations**

3- **Energy**

4- **Thermal energy – work done in the expansion and compression processes of ideal gases – chemical energy or internal energy**

5- **Zero Law of Thermodynamics**

The First Law of Thermodynamics - Isothermatic and Adibatic Processes - Heat Capacity of Ideal Gases - Applications of the First Law of Thermodynamics - Heat Capacity - Reversible and Irreversible Isothermal Expansion and Contraction Processes - Adidactic Reversible Expansion Processes - Joule Thomson Coefficient - The relationship between enthalpy and internal energy

II. Thermochemistry

1- **Introduction - Rapid reaction and full interaction - pure interaction - standard state and agreed signal**

2- **Heat reaction**

3- Laws of Thermochemistry

Hesse's law of constant addition – Composition heat – Solution temperature – Exchange heat – Combustion heat – Temperature change of reaction with temperature – Bond energy – Examples

Second law of thermodynamics

Introduction and text of the law – Cartoon cycle – Cartoon cycle efficiency – Entropy changes for reversible and non-reversible processes – Entropy changes for gas systems – Entropy changes for liquid and solid systems – Entropy change for a mixture of ideal gases – Integration of the first and second laws of thermodynamics

IV. Free Energy

1- Introduction to derivation of the equation of free energy - the dependence of free energy on pressure - free energy for chemical reaction - the dependence of free energy on temperature: A- Gypsum equation B- Helmholtz equation C- Clapeyron equation D- Clausius-Clabyrne equation

2- Chemical Systems

Basic Equations of Closed Systems – Maxwell Relationships

3- Chemical Potential

4- molar molar volumes

5- Free energy and measured free energy and their relationship to the equilibrium constant

6- Dependence of the equilibrium constant on temperature (Vant Hof equation)

7- Ideal and non-ideal solutions - Rault's law - aggregate properties (decrease in vapor pressure - decrease in freezing point - increase in boiling point - osmotic pressure)

Sources

1- Physical Chemistry (Theoretical Foundations and Applications) authored by Anis Abdul Wahab Al-Najjar - Mosul University Press - 1986

2- Physical Chemistry (Advanced Problems and Solutions) written by Anis Abdul Wahab Al-Najjar and Khaled Al-Ani - Basra University Press - 1980

3- Physical Chemistry - authored by Jalal Muhammad Saleh - Baghdad University Press - 1977

4- Physical chemistry , By Atkins – oxford press

CHEM222 / Electrochemistry: Electrochemistry gives information about a number of phenomena such as metal technology, corrosion, the cause of corrosion, the study of cells generating electricity directly, and knowledge of how redox reactions occur.

Curriculum K 222

1- **Electrical conductivity**
General introduction – Metal conduction and electrolytic conductivity – Types of electrical conductivity – Types of liquids – Units used in electrochemistry – Fradi's laws of electrolysis – Electrochemical equivalent – Electrochemical reactions (comparison between molten salts and aqueous media)
2- **Measurements of electrical conductivity Specific resistance and Ohm's law - Specific conduction - Cell constant - Equivalent conduction and molar conduction - Direct current and alternating current - Wheatstone bridge**
3- **Electrical conductivity change with concentration**
Strong electrolytes (fully dissociated) and weak electrolytes (incompletely dissociated) - Kohlrach equation - molar and equivalent conduction at zero concentration - The origin of electrolytic theory (Arenus' law - How to determine λº in weak electrolytes - Kohlrach's law of independent ion migration - Ostwald's law of dilution
4- **Ionic transition**
Transition Preparation (Single Solution and in Mixture) Transition Preparation Measurement (1-Hiturf Method 2-Moving Separation Limit Method) Transition of hydrogen and hydroxyl ions – Optimization of ion model in aqueous solutions (solvent role and dielectric constant) – Ionic activity coefficients and their dependence on the ionic intensity of the solution – Deby's theorem – Structure and coefficient of effectiveness – Electrical conductivity theory – Voss equation – Unsacker – Ionic assembly – Walden rule – Practical applications of electrical conductivity measurement (dissociation constants for weak acids and bases) – Hydrolysis constants – Hydrations for measuring electrical conductivity) – Solubility of sparsely soluble electrolytes – Ion yield of water
5- **Electrochemical cells at equilibrium**
6- **General Introduction – Double Electric Layer – Definition of Cell Potential Difference – Electric Potential Difference of Galvanic Cells – Electromotive Force and Cell Interactions – Circuit Bonding – Standard Weston Cell and Thermal Treatments – Types of Semi-Cells (Electrodes) – Gas Electrodes – Metal Electrodes and their Ions – Amalgamated Electrodes – Oxidation and Reduction Electrodes – Non-Gas Non-Metal Electrodes – Metal electrodes and insoluble salt such as (Ag/AgCl) and calomel electrode (Hg/Hg2Cl2)) – Metal electrodes and sparsely soluble oxide**
7- **Reflex cells**
Changes in the free energy of cell reactions – Electrode voltage and how to calculate it – Standard driving force of cells – Dependence of E on concentration and efficiency – Thermodynamic functions of the electrochemical cell – Standard applications E (Determination of standard electrode potentials – Determination of efficiency coefficients – Determination of thermodynamic dissociation constants and dissolution products – Calculation of the ionic quotient of water – pH

measurements – Hydrogen electrode – Oxygen electrode – Quinone electrode – Glass electrode and its types – Hydration Jihadism

8- **Focus cells**
Polarity and electrolytic with and without transition

9- **Electrical cells at imbalance**
Non-reversible cells and polarization – dissociation potential – supervoltage – cells with fixed poles – mechanics of processes at poles – specific current (diffusion current) – electrochemical corrosion (general introduction)

CHEM315 / Heterogeneous aromatic compounds: Introducing students to the names and composition of heterogeneous aromatic compounds, as well as methods of preparation and interactions because of their great importance, as this type of compounds is involved in many aspects of life such as pharmaceutical industries.

Curriculum CHM 305

1- **General introduction**

2- **Heterocyclic compounds similar to cyclopentadiene ring containing a heterogeneous atom**

2.1 Pyrrole

2.2 Fioran

2.3 Theofen

3- **Compounds similar to benzene containing a heterogeneous atom: pyridine**

4- **Pentacombs containing two heterogeneous atoms**

4.1 Perazole

4.2 Amidazole

5- **Ring compounds similar to naphthalene containing a heterogeneous atom**

5.1 Quinoline

5-2- Isoquinoline

6- **Hexagonal cyclic compounds containing two heterocyclic atoms: pyridazine**

7- **Naphthalene-like cyclic compounds containing two heterogeneous atoms: Synolin**

8- **Cyclic compounds fused with pyrol ring, indole**

Each chapter includes chemical and physical properties – preparation methods – reactions and presence.

Sources

1- **Introduction to the Chemistry of Heterocyclic Compounds - translated by Dr. Fadel Kamouna and Dr. Iqbal Al-Shaibani**

2- **The chemistry of hetrocycles by Hans Suschitzky and Judith Suschitzky**

CHEM321 / Kinetic Chemistry: The course aims to introduce the student to the mechanics of reactions, calculate the speed of reactions and the extent of consumption of quantities of reactants over time in terms of concentrations, volumes or pressures, especially for gaseous substances, determine the paths of reactions, arrange the reaction, classify reactions according to phases and molecular multiplexy, and how to calculate the energy associated with the occurrence of the reaction, such as activation energy and thermodynamic functions to which the rates of speed of reactions are related. It is also possible to identify cofactors and temperature and how these two factors affect the rate of speed of reactions, in addition to studying multiple types of reactions.

Curriculum CHEM321

1- **Kinetics of chemical reactions**

Overview – Classification of reactions according to (phase, molecular multiple, reaction rank) – Definition of each of (degree of reaction – rate of reaction speed, constant rate of reaction speed, half-life)

2- **Degrees of interaction**

2-1- Grade Zero Reactions – Calculation of Reaction Speed Rate – Reaction Rate Constant – Half-Life

2-2 - First order reactions - calculation of the rate of reaction speed - constant reaction speed rate - half-life - calculation of the first degree in terms of (concentrations, volumes, pressure, absorption, conductivity, angle of polarization, nuclear reactions)

2-3- Second degree interactions with similar and different concentrations - calculation of the reaction speed rate, reaction speed rate constant, half-life, special second degree, nomadic reactions of the first degree

2-4 - Third degree interactions class (first, second and third) - calculation of the rate of reaction speed - constant rate of reaction speed - half-life

2-5- Class N reactions - calculation of the reaction speed rate - reaction rate constant - half-life

3- **Methods for finding the degree of interaction**

3.1 Method of change of ratios

3-2 - method of integration or attempt - theoretical application - graphic methods

3-3 - methods of half-life - graphical method - the relationship between half-life and the rate of reaction speed - practical method - the relationship between half-life and primary focus

3-4 - Differentiation method - theory - graphically

3.5 Initial velocity rate method for complex reactions

3.6 Insulation method

4- Complex interactions

4-1- Opposite reactions, calculations of differential and integral equations (1st X1st $[B]_{0=0}$) Determination of K1 and K-1 value of slope and in terms of concentrations and equilibrium constant, (1st X1st [B]0= b), (1st X2nd), (2nd X 1st) (X2nd 2nd)

4-2- Successive interactions, calculations of differential and complementary equations to calculate concentrations A, B, C and the time required for the highest concentration of B

4-3 - Parallel interactions class I and II - calculations of differential and complementary equations for the calculation of concentrations A, B, C for the two classes

4-4- Chain reactions - calculation of the rate of reaction speed - steady state hypothesis - determination of reaction mechanism - specific step method for reaction speed

5- The effect of temperature on the rate of reaction speed - activation energy - Arrinius equation - calculation of thermodynamic functions according to Arrinius' theory

6- Theories of reaction speed

1. **1- Collision theory - productive and non-productive collision - calculation of the total collision frequency (for one molecule, for different molecules, for similar molecules) - calculation of the average speed of the molecule - calculation of the active part of collisions - calculation of the reaction speed rate - calculation of the reaction speed rate constant - calculation of frequency coefficient - calculation of activation energy - calculation of vacuum obstruction coefficient.**
2. **-2- Active complex theory - Calculation of the reaction speed rate - Calculation of the reaction speed rate constant - Calculation of thermodynamic functions according to the active complex theory -**

Calculation of frequency coefficient - Calculation of activation energy - Calculation of the reaction velocity constant for solutions and gases - Difference between collision theory and active complex theory

7- Factors affecting the rate of reaction speed

7-1- Solvent effect – dissolving process – dielectric constant – solvent viscosity

7-2- The effect of pressure on the rate of reaction speed - the volume of activation - the calculation of the constant rate of reaction speed in terms of pressure

7-3- The effect of ionic force on the rate of reaction velocity - Debye Hegel's equation - ionic intensity - the main effect of salt Brønstedt-Gram's equation - the secondary effect of salt

8- Quick interactions

8-1- Flow methods - contact methods - fixed flow method - moving flow method -

8-2- Loosening method - derivations of lax time

9- Cofactors

Homogeneous catalysts – Heterogeneous catalysts – Qualitative stimulation – General catalysis – Enzymes as catalysts – Michalis constant

Sources

1- **Physical Chemistry (Advanced Problems and Solutions) written by Anis Abdul Wahab Al-Najjar and Khaled Al-Ani - Basra University Press - 1980**

2- **Principles of the speed of chemical reactions written by Ali Abdul Hussein Saeed**

3- **Kinetic and electrochemistry written by Ahmed Hashem Al-Dabbagh and Banan Akrawi**

4- **Physical chemistry , By Atkins – oxford press**

5- **Physical chemistry by Moore , Logman 1962**

6- **Elementary reaction kinetic by latham**

CHEM324 / Molecular Spectroscopy Chemistry: Definition of Permian Electronic Resonance – Theory – ESR Signal Origin – Zeman Effect – G Factor – Ultrafine Pairing – Glass Solutions – Relative Intensity and Number of Beams – Permian Electronic Resonance Spectra for Free Radicals – Permian Electronic Resonance Spectra for Transition Elements – Uses and Applications. Maspor spectroscopy Maspor effect – isotope displacement – Nuclear tetrachute dichotomy – Magnetic superfine mutual effect – Applications

Curriculum CHM 324

1- **Introduction**

Electromagnetic radiation – Quantization of energy – Schrödenker equation Spectrum regions – Width and intensity of electronic transitions – Basic components of the spectrum

2- **Microwave spectroscopy**

Molecular rotation – Rotation spectra – Diatomic particle rotation spectra – Hard rotor – Isotope compensation effects – Non-rigid rotor – Spectral line intensity – Multiatomic molecule rotation spectra – Applications

3- **Infrared spectroscopy**

Diatomic particle vibration – Diatomic molecule vibration spectra – Harmonic vibrator – Aharmonic vibrator – Rotation vibration of diatomic molecules – Bourne Oppenheimer approximation insufficiency – Polyatomic atom vibration – Applications

4- **UV and visible spectroscopy**

Electron spectroscopy – Diatomic molecule spectra – Multiatomic molecule spectra – Charge transfer spectra – D-D transitions – Applications

5- **Nuclear magnetic resonance spectroscopy**

Magnetic properties of nuclei – Ziman mutual effect – resonance conditions – chemical displacement – twirl twirl – analysis of nuclear magnetic resonance spectra – applications

6- **Permian electronic resonance spectroscopy**

Magnetic properties of the electron – Reciprocal effect of Zeman – Resonance conditions – G-factor – Ultrafine pairing – Permian electron resonance of free radicals – Permian electronic resonance factor of elements

7- **Maspar spectroscopy**

8- **Probe effect – isotope displacement – tetrapole nuclear couple – magnetic superfine mutual effect – Applications**

CHEM342 / Metabolic Biochemistry: Identify the metabolic interactions of biological compounds and what are their metabolic products. and how to regulate metabolic reactions.

Curriculum CHEM342

1- **Vitamins (composition and classification)**

Fat-soluble vitamins - water-soluble vitamins

2- **Chemistry of hormones**

Thyroid hormone – pancreatic hormone (insulin and cocacon) – adrenaline hormone –

3- **Biological oxidation**

Enzymes associated with redox reactions – high-energy compounds in biological oxidation – foundations and laws in energy production

4- **Carbohydrate metabolism –**

Anaerobic oxidation (glycolisis) – Construction and catabolism of glycogen – Aerobic oxidation (crepe cycle and tricarbosyl acid cycle) – Cycle of pen-phosphate sugar – Preparation or construction of glucose from non-carbohydrate sources

5- **Fat metabolism**

Fatty compounds prevalent in the blood – lipid oxidation – lipid biosynthesis – unsaturated fatty acid metabolism – ketone bodies –

6- **Protein metabolism**

Nitrogen balance – Amino acid catabolism – Cracking of the carbon structure of amino acids – Urea cycle – Amino acid biosynthesis – Protein biosynthesis

CHEM343 / Clinical Biochemistry: Objectives: Introduce the student to clinical biotechnologies and how to deal with analysis models conducted in medical laboratories.

Curriculum CHEM343

1- **Introduction to Clinical Biochemistry**

Definition of clinical chemistry – Why do we study clinical chemistry – Collection and preservation of samples (blood – urine – stool) – Factors to be taken into account before collecting samples – Factors to be taken into account at the time of sample collection – Possible changes in blood samples and urine after collection

2- **Carbohydrate metabolism**

Control of glucose metabolism (insulin, glucacon, and other hormones) – Measurement of blood glucose and diuretic levels – Diabetes, its classification and types – Diabetes and ketone bodies – Abnormal metabolism in the liver during diabetes – Low blood glucose level

3- **Fat metabolism**

Introduction – Cholesterol – Triglycerides – Phosphorous lipids – Fatty acids – Cholesterol metabolism – Lipid metabolism disorders – Lipoprotein – Obesity – Atherosclerosis Angina and heart attack

4- **Protein metabolism**

Plasma proteins – Chemical and physical methods for measuring proteins – Immunological methods for measuring proteins – Resulting diseases Changes in plasma protein concentration – Aminoclobulins (structure and classification) – Iminoclobulin formation disorders – Protein metabolism disorders

5- Hormones

Mechanics of the action of hormones - thyroid hormones and their concentration in plasma - effects of increasing or decreasing thyroid secretions - growth hormones

CHEM351 / Principles of Industrial Chemistry: Industrial Chemistry is an undergraduate course in Chemistry. Industrial chemistry is the process of developing, improving, and controlling basic chemical processes used in industry to convert raw materials and precursors into commercial products beneficial to society. The Industrial Chemistry program provides a broad education in the field of chemistry.

Curriculum K 351

1- Foundations and economics of chemical manufacturing processes

Factors affecting capital costs – factors affecting production costs

2- Types of chemical manufacturing processes

Continuous Industrial Operations – Meal Industrial Operations

3- Intermittent Process Reactors

Gaseous – liquid, liquid-solid, gaseous - solid, including the presence of homogeneous catalysts, including the presence of heterogeneous catalysts - production and conversion outcome

4- Flow curves for industrial processes

5- Material balance

6- Chemical corrosion and ways to prevent it

Types of corrosion - corrosion theories - factors affecting corrosion - corrosion prevention - membrane protection - chemical prevention - electrochemical prevention - corrosion tests and methods of reducing corrosion

7- Industrial pollution

Industrial water pollution – types of industrial water pollutants – wastewater treatment processes

Industrial air pollution and methods of treatment

8- Industrial Water Treatment

Water sources for industry and water quality used in industry – methods of water treatment in industry

CHEM352 / Polymer Chemistry: This course aims to learn the general aspects of polymer chemistry, classifications and natural and synthetic types, as well as through this course the study of polymerization reactions of all kinds, including step-growth polymerization (condensation) and chain polymerization (addition) and clarify some chemical reactions that can be made on the polymer. This course covers not only basic aspects, but also advanced research and applications of polymers in materials science.

CHEM352

Chapter One:

1- General introduction - what is meant by polymer - history of polymer science - sources of polymers - natural polymers - prepared polymers.

2- Label polymers-

Simple filamentous polymers - Designation of polymers resulting from condensation or addition - Designation of condensation polymers - Designation of copolymers - Designation of randomly formed copolymers - Nomenclature of alternating copolymers - Nomenclature of grafted copolymers - Nomenclature of lumpy copolymers (mold) - General and commercial nomenclature - Chemical nomenclature according to IUPAC -

3- Factors determining the qualities of the polymer

Molecular weight of the polymer - nature of the molecular chain of the polymer - molecular forces

Chapter Two:

1- Types of polymers and their classification

A. Inorganic polymers B. Organic polymers C. Technological classification of polymers

1.Heat wrought polymers (plastics) 2. Thermally hardened polymers 3. Fiber 4. Elastic polymers (rubber)

2- Classification of polymers based on reactions leading to their formation

A. Old classification (additive polymers and condensation polymers) B. Modern classification:]1.Sequential growth polymerization (free radical polymerization, catonic polymerization, anionic polymerization and coordinate polymerization) 2. Step-polymerization [

Chapter Three

Polymerization processes and conditions

A. Homopolymerization: 1. Mass polymerization 2. Polymerization of solutions

B. Heterogeneous polymerization: 1. Polymerization in plankton 2. Polymerization in emulsions 3. Polymerization between the two surfaces of solution 4. Polymerization in gaseous phase 5. Deposition polymerization

Chapter Four

Important industrial polymers with step-growth

- Polyesters - General Introduction: A. Aliphatic filament polyesters B. Aromatic filament polyesters c. Branched and crosslinked polyesters D. Polyesters Non-carboxylic acids

Polyamides - Polyurea - Polyurethane - Phenol-formalhyde resins (Resol and Novolac) - Urea-formaldehyde resins - Melamine-formaldehyde resins

Chapter Five

Polymer properties, diagnosis and analysis - Physical properties of polymers: 1.Crystallization and melting point

2. Glass case and glass transition degree

CHEM353 / Petroleum Chemistry: The course aims to provide the students with information about crude oil and its derivatives, methods of evaluating the qualitative specifications of oil derivatives, and what are the most prominent chemical and physical processes that take place in refineries to produce the required oil derivatives in the markets, then know all types of petroleum products and their additives.

CHEM353

1- **Oil**

Introduction – Theories of the Origin of Oil – Chemical Composition of Oil

2- **Chemical processes in oil refining**

Thermal solution – Thermal catalytic solution – Hydrogen solution – Catalytic polymerization – Catalytic alkylation – Catalytic isomerization – Phastic structural transformation

3- **Composition of crude oil and its derivatives**

Specific weight – viscosity – degree of flash – degree of fire – degree of combustion – volatility – degree of inline – ash content – destruction – cetane count and cetane coefficient – degree of cloudiness – doctor's examination – degree of distillation – octane number – number of penetration – degree of spill

4- **Refinery Products**

Products with low boiling points – gasoline – naphtha and kerosene – diesel fuel – heating oils – diesel engine fuel

5- **Petroleum classification**

6- **Crude Oil Processors**

7- **Petroleum Refining**

Distillation of all kinds - solvent extraction - absorption and abstraction - adsorption and adsorption

CHEM 333/ Green Chemistry: Green chemistry began in the United States in 1990 after the Pollution Prevention Act was signed, which aimed to protect the environment by reducing harmful emissions from the same source. Under the law, the United States Government has awarded grants for the development of chemical products through various institutes and universities to reduce the risks of these substances. The objectives of the grants provided for the production of chemicals that neutralize harmful substances, reduce pollution and develop alternatives to chemicals that lead to their extraction processes to pollute the environment have evolved. Green chemistry seeks to make chemistry an integrated science by reducing the pollution caused by the chemical industry important to the pharmaceutical, pharmaceutical, petroleum and plastic industries by preventing the formation of this pollution in the first place.

Vocabulary of the Green Chemistry Course (KM 333)

1- Overview of Green Chemistry

- **The main objectives of green chemistry**
- **The beginnings of green chemistry**
- **Sustainable Development and Green Chemistry**
- **The Twelve Principles of Green Chemistry**

2- The economy of corn

- **Waste Reduction and Corn Economy**
- **Efficiency of the atom for total reaction**
- **Sheldon scale and the economy of corn**
- **Some interactions of the natural atom economy**

3- Limit the use of materials

- **Control the use of stimuli**
- **Choosing the right protection groups**
- **Reducing the use of non-renewable raw materials**
- **Process intensification**

4- Reduce energy requirements

- **Some improvements in energy efficiency**
- **Alternative energy sources**
- **Energy generated from waste**

5- Reduce toxicity and reduce risk

- **Control of substances hazardous to health**
- **Toxicometry**
- **Lethal dose and lethal concentration test**
- **Hogg Westerner scale**
- **AMES Test**

6- Waste reduction

- **Health problems caused by waste**
- **Waste management and waste management hierarchy for non-hazardous materials**
- **Waste prevention and reuse**
- **Reduce waste**
- **Recycling**
- **Energy recovery from waste**
- **Waste disposal**

7- On-site waste treatment

- **Types of biological treatment plants**
- **Physical and physical treatment**
- **Chemical processing**
- **Bioremediation**

8- Motivation and green chemistry

- **Types of Motivation Reactions**
- **Heterogeneous catalysts**
- **Homogeneous catalysts**

9- Green solvents

- **Solvents and the need for alternative solvents in green chemistry**
- **Safety considerations and green standards of solvents**
- **Environmental characteristics theory, health and safety**
- **Life Cycle Assessment Theory**

Sources:

1. Green Chemistry: An Introductory Text
by Mike Lancaster
2. Green Chemistry and Processes
By Mukesh Doble
2. Handbook of Green Chemistry and Technology
by James Clark and Duncan Macquarrie

CHEM 302 / Nanochemistry: It is a course for the final stages as it is a very modern science where we now live in the nano-age. It is very important for its wide applications in all industrial, medical, agricultural, engineering and many other sciences. It focuses on introducing the student to the nature of manu and methods of preparing and diagnosing nanomaterials and their applications. It is also taught

to students of preliminary and postgraduate studies due to its applied importance in scientific research and medical centers.

The syllabus of inorganic nanomaterials:

- **Introduction**
- **History**
- **Definition of nanoparticles, nanomaterials, nanoscale.**

Nanomaterials:
-Chemical and physical properties
-Surface area to volume
-Quantum effect
-Types of nanomaterials (zero dimension, one dimension 1D, 2D, 3D) with examples
- **Bottom –up**
- **Top-down**

-Preparation methods: (Redox reactions, Self-assembly and Sol gel)

- **Metal inorganic nanomaterials:**

Ag NPs
Au NPs
Cu NPs
There are NPs
Ru NPs
others

- **Metal oxide inorganic nanomaterials:**
  TiO2, SiO2, CuO, ZnO NPs
  Shape and size effect
- **The effect of the factors**
- **Characterization of NPs using:**

  SEM
  TEM
  XRD
  UV-Vis
- **The applications of NPs**

CHEM401 / Chemistry of transition elements: Know some of the characteristics of the elements of the three transition chains, their compounds, beliefs, methods of isolation and diagnosis, and use some of them as cofactors.

1- Introduction to the Chemistry of the Three Transition Elements

1-1- Periodic characteristics: electronic arrangement - melting and boiling points - winnowing - ionization potential - electronic affinity

1-2- Oxidative states: oxidative numbers of common and uncommon states - oxidation and reduction potential - electrode potential

2- Chemistry of the first transition series

2-1- Its existence in nature - estimation and methods of extraction and purification - extraction and purification of iron, copper and zinc

2-2- Its compounds and preparation

2-3- Their complexes and preparation

2-4- Interactions

3- Diagnosis of transition metal complexes

3-1- The importance of diagnosing it

3-2- Analytical and physical methods - accurate elemental analysis - electrical conductivity methods - qualitative and quantitative analysis - determination of isomers

3-3- Spectral methods – Visible and ultraviolet radiation – Infrared radiation – Mass spectroscopy – X-ray – Nuclear magnetic resonance – Permian electronic resonance – Photoactivation

4- Stability of transition metal complexes

4-1- Kinetic stability – inert and effective complexes

4-2- Thermodynamic stability

4-3- Factors affecting stability - the effect of metal ion - Ligand and other factors

5- Transition Elements as Catalysts – Overview

CH 402: Nanochemistry: Introducing the student to the concepts of inorganic nanomaterials because of their scientific importance, especially as we live in the nano-age.

CHEM402 / Selected Topics : Mechanics of Inorganic Reactions Number of Semester Units : 3

Curriculum CHEM402

1- Nature and quality of mechanical

1-1- Synthetic information

1-2- Reaction kinetics

1-3- Stability and idle / speed rate and mechanical

1-4- The extent to which the velocity rate and the velocity constant depend on the concentration and nature of the reactants

2- Substitution reactions for

2-1- Octhedral complexes

2-2- Tetrahedral complexes

2-3- Quadruple planar complexes

3- Redox reactions

3-1- E-Transition

3-2- Extra-Consistency Ball Interactions / Intra-Consistency Ball Interactions

3-3- Complementary and non-complementary reactions

3-4- Oxidative Addition Reactions

3-5- Oxidative Compensation Reactions

4- Catalytic reactions

5- EThe hydrogenation of alkenes

6- Polymerization of alkanes and alkenes

7- Hydroform reactions

CHEM403 / Chemistry of anhydrous solutions: The course aims at multiple concepts. The curriculum deals with topics related to anhydrous solvents and their role in chemical reactions and the characteristics and type of each solvent, and the curriculum also includes an explanation of acids and bases in anhydrous solvents and how to measure their strength. The curriculum also addresses an important topic in chemistry and related to the stability of reactant compounds and theoretically expected products that were said to be carried out reactions. The so-called acids, harsh and soft bases and in detail for all inorganic reactions.

Curriculum K403:

1- Chemistry in non-aqueous solvent

Common non-aqueous solvents , Amphoteric behavior, the coordination model , chemistry in liquid ammonia , ammunition reaction , ammonolysis reaction , metathesis reaction , acid-base reaction , metal-ammonia solution , liquid

hydrogen fluoride , liquid sulfur dioxide , chemistry in ethanoic acid , liquid dinitrogen tetraoxide N2O4

2- Acid base chemistry

History, Major Acid , Base concepts , Arrhenius concepts, Bronsted-lowry concept , solvent system concept, Lewis concept, Frontier Orbitals and acid-base reactions , Hydrogen bonding , Electronic spectra (Including charge transfer)

3- Hard and soft acids and bases

Theory of hard and soft acids and bases , Quantitative mechanism

4- Acids and bases strength

Measurement of acid base interactions , thermodynamic measurements , proton affinity , acidity and bascity of binary hydrogen compounds , inductive effects , strength of oxy-acids , acidity of cations in aqueous solution , steric effects , solvation and acid-base strength , non-aqueous solvent and acid base strength , super acids

5- Polyoxo compounds formation

Polymerization of aqua ions to polycataions , ploy oxoanions , Hetrogeneous acid-base reaction

References

1- G. L Missler and D A Tarr " Inorganic chemistry " 3rd edition

2- D F Shiver , P Atkins and C H Langford 2nd edition " Inorganic chemistry". Chapter 5

CHEM416 / Organic diagnostics: Diagnosis of organic compounds by spectral methods such as infrared technology, proton nuclear magnetic resonance technique, ultraviolet and visible technology.

Curriculum C416:

1- Visible and UV spectroscopy
- **1-1- We present about electronic absorbents and their types**
- **1-2- Simple chromophore aggregates, types of spectral displacements and variation of absorption intensity**
- **1-3- Experimental rules for guessing absorption sites**

1.3.1 Butadiene fashion like

1.3.2 Cycloid dienes
- **1-4- Carbonic chromophores and solvent effect**
- **1-5- Uncompensated gasoline ring absorbers and compensation effect on absorption and solvent effect**

2- Infrared spectroscopy

2-1- Different vibrations of particle bonds
2-2- The relationship of stretch vibration with the law of Hook
2-3- Harmonic and ultra vibration tone
2-4- Dual action exchange of vibrations
2-5- Representation of infrared spectra
2-6- The relationship of absorption intensity to dipole moment
2-7- The relationship of the angle of the bond with the verb tiadel, stretch type – stretch
2-8- Interchange Verb Type Bending – Bending
2-9- Interchangeable Verb Curvature Type – Stretch
2-10- Comprehensive survey of the sites of vibrational absorption of the bonds of the main classes of organic compounds and the interpretation of their spectra

3- NMR spectroscopy of protons
3-1- Introduction
3-2- Chemical displacement
3.2.1 Definition of chemical displacement and measurement of displacement and its relationship to frequency and field strength
3.2.2 Factors affecting chemical displacement
3.2.3 Dimagnetic blocking (induction effect)
3.2.4 Psychotropic effect
3.2.5 Paramagnetic effect
3.2.6 Vanderwaals effect

3-3- Double twirl - twirl (first degree approximation)
3.3.1 Definition of the phenomenon
3.3.2 Interpretation of the fission of Burm-Boram
3.3.3 Dual constant and simple fission pattern
3.3.4 Rules for guessing the fission pattern
3.3.5 Physical effects on twirl-twirl
3.3.6 Exchange phenomenon
3.3.7 Four-pole torque phenomenon
3.3.8 Review of the absorption sites and interpretations of different protons
3.3.9 Integration and calculation of the number of protons
3-4- Double twirl – twirl (second degree approximation)
3.4.1 Chemical equivalence and magnetic equivalence
3.4.2 Proton coding
3.4.3 Complex systems of fission patterns
3.4.3.1 AB system , displacement calculation and double constant
3.4.3.2 Descriptive presentation of different types of second-class systems AB2, ABX, AAXX, ABC, A2B2C3
3-5- Compensated gasoline
3.5.1 Allelic duplications
3.5.2 Couples between adjacent protons
3.5.3 Pairs between twin protons
3-6- Dewy and dystropic protons

3-7- Means of simplifying spectra

3.7.1 Increased magnetic field strength

3.7.2 Deuterium replacement

3.7.3 Irradiation to decouple

3.7.4 Solvent change

3.7.5 Use of displacement detectors

4- Mass spectroscopy

4-1- Introduction

4-2- Mass spectrometer

4-3- Some important rules

4.3.1 Nitrogen base

4.3.2 Pair electron rule

4-4- The relative abundance of some elements

4-5- calculate the number of carbon atoms,

4-6- Calculation of molecular formula

4-7- Semi-stable peak

4-8- Ionization and various fissions of chemical bonds

4-9- Fractionation rules

4-10- Interpret the characteristic packages of the main organic compound classes

CHEM426 / Radiation and Nuclear Chemistry: The student's knowledge of what nuclear chemistry is, its difference from general chemistry, the difference between unstable and stable radioactive elements, the types of radiation they emit, how to protect living organisms from radiation and their applications in the medical and industrial fields and in the field of nuclear weapons industry.

Curriculum C426:

1. **Introduction**
   The origin and structure of atomic theory - the structure and construction of the atom - the structure of the nucleus, its mass and size
2. **Nuclear Items**
   Nuclear properties – forces between nuclei – meson theory – elementary nuclear particles
3. **Introduction to Radiochemistry**
   Radioactive elements and their types - Radiation and its types - Radiation and its physical and chemical effects
4. **Ionizing radiation**
   Alpha Ray – Beta Ray – Gamma Rays
5. **Nuclear decay**
   Nuclear Decay Laws – Measurement of Nuclear Decay – Nuclear Dissolution Schemes
6. **half-life**
   Methods for measuring half-life
7. **Life**
   Radiation balance
8. **Nuclear accelerators and their types**

9- **Nuclear reactors and their types**
10- **Nuclear fuel and its types**
Methods of enriching nuclear fuel – tranquilizers – control electrodes – cooling medium – protective casings
11- **Reactors with fast neutrons**
12- **Nuclear reactions**
Nuclear fission – nuclear fusion
13- **Energy sources in nuclear reactors**
14- **Devices used for radiometry**
15- **Units of measurement of rays**
Authorized doses – biological effects – radiation protection
16- **Applications in Analytical Chemistry**
Foundations of revitalization analysis - areas of use of activation analysis - peer-investigation analysis
17- **Radioisotopes in physical chemistry**
18- **Study of the mechanics of chemical reactions**
Fission Site Diagnosis – Chemical Bonds

CHEM427 / Liquid crystals: The course includes the subject of liquid crystals and their applied importance in the industrial and medical fields, it focuses mainly on understanding the basic principles of liquid crystals and their types (lyopy and thermotropics) depending on their chemical composition, which directly affects the emergence of their different phases and how to diagnose and identify them accurately. Liquid, which is considered one of the most important applications of this topic, and finally focus on the basic aspects of the use of these materials in pharmaceutical and medical applications.

Curriculum C427

1- **Introduction – Definition of corrosion and causes of its occurrence**

2- **Purpose of the corrosion study**

3- **Factors affecting corrosion**

4- **Solution chemistry for corrosion**

5- **Important terms specific to corrosion**

6- **Types of erosion cells**

7- **Erosion treatment methods**

Cathodic protection – anodic protection

8- **Types of corrosion inhibitors**

Organic inhibitors – Inorganic inhibitors – Coating

9- Corrosion measurement methods

Weight loss methods – polar method

CHEM431 / Chemistry of Instrumental Analysis: The course includes a detailed explanation of the basic principles of instrumental analysis, spectroscopy and various spectroscopy such as ultraviolet visible spectroscopy, infrared spectroscopy, atomic absorption spectroscopy in all its details, fluke and phosphorylation techniques.

Curriculum C431

1- Introduction – Photoanalysis Methods

1-1- Types of automated analysis methods

1-2- Electromagnetic spectrum – wave and particle nature of electromagnetic beam – absorption of rays – types of transitions

1-3- Chromotoro and oxocromium – red displacement – blue displacement – charge transfer absorption beams

2- Devices used in photoanalysis

2-1- Sources used in the ultraviolet zone – visible and infrared

2-2- Reagents – Cell Voltage – Photocell – Photomultiplier –

2-3- Filters and miscellaneers (uniform color) – filters – absorption filters – color units – diffraction grooved – prisms

3- UV and visible absorption

3-1- Radiation Absorption Laws

3-2- Bert-Lambert's Law – Absorbency Constant – Deviation from Beer's Law – Instrumentation Factors – Chemical Agents

3-3- Devices used to measure visible and ultraviolet rays

3-4- Applications

3-5- Mix Analysis – Symmetry Point – Molar Ratio Method – Continuous Variation Method

4- Fluorescence and phosphorylation

4-1- Introduction

4-2- Fluorescence and phosphorylation theory – the relationship of concentration with fluorescence intensity

4-3- Suppression

4-4- Used Devices & Applications

5- Infrared radiation

5-1- Preparation of the solid model of measurements – gases – liquids

5-2- Quantitative Analysis

5-3- Devices used

6- Flame atomic emission and absorption spectrum

6-1- Introduction

6-2- Types of flame and measurement of flame temperature – speed of gases

6-3- Fireplaces – types of stoves – pros and cons

6-4- Induced processes in flame

6-5- Methods of entering the model – liquid solid

6-6- Overlaps

6-7- Non-flame atomic absorption

6-8- Atomic emission spectroscopy in inductively coupled plasma plasma - Advantages of emission plasma - Use of plasma as a medium for ablation - Use of plasma in atomic telephoresis

6-9- Atomic fluorescence – types of flame atomic fluorescence – devices used – interventions

6-10- Devices used in technologies

CHEM444 / Selected Topics in Biochemistry: The teaching of this course aims to present some important topics in the field of biochemistry that clarify the relationship of chemistry to body functions and clarify the chemical variables that occur within the body.

Curriculum C444

Technologies for separation and isolation of large biomolecules

1- Leaf chromatography and thin layer

1-1- Rules and basics of chromatography
1-2- What is the chromatography of the leaf?
1-3- Moving phase and fluid flow
1-4- What is the thin layer
1-5- The mechanism of work and how to prepare the laminate
1-6- Applications of paper chromatography and thin sheets

2- Electrical migration

2-1- Fundamentals of electrical relay and working theory
2-2- Logical electrical relay
2-3- Free Electric Relay
2-4- Factors affecting the separation process
2-5- Electrical Migration Applications

3- Gel filtration
3-1- Types of gels and the most commonly used and common
3-2- Bulging process and column filling
3-3- The mechanism of separation and distribution of ranges inside and outside the gel
3-4- Quantification of models
3-5- Gel filtration chromatography applications

4- Liquid chromatography
4-1- High performance liquid chromatography
4-2- The basics of this technique
4-3- Why and to whom is this technology used
4-4- Chromatography of the inverse phase

5- Gas chromatography
5-1- Carrier gas specifications and features
5-2- Types of columns used
5-3- Detectors used to sensitize isolated materials

6- Ion exchange chromatography
6-1- Types of resins used
6-2- Method of separation and isolation of models

7- Extraction and purification of biological macromolecules using laboratory methods for the purpose of isolation and separation

CHEM455 / Polymer Manufacturing: The course aims to give a clear idea of what is meant by polymer manufacturing, which includes converting the polymer into a final product using one of the manufacturing methods, which depends on the quality of the polymer, whether it is a wrought or non-wrought polymer to heat, in addition to giving optimal conditions for the manufacturing process. On the other hand, from the practical side, the most important mechanical properties of polymers and methods of measuring them are addressed to give a clear idea of the polymer before using it in the place designated for it.

Curriculum C455

1- Introduction to the classification of polymers from a technological point of view

Plastics (thermoplastics) – thermally hardened resins – Rubber polymeric fibers – Polymeric compositions – Polymeric mixtures – Polymeric alloys – IPN interference network polymers

2- Streamlined properties of polymers - factors affecting them - how to adopt these characteristics in the manufacture of polymers

3- **Polymer manufacturing techniques – molding of all kinds – extrusion – injection – vacuum forming – casting – polishing**

4- **Molds used in polymer manufacturing – study of the relationship between the geometry of the mold and the molecular orientation of polymeric chains**

5- **Molecular orientation of polymeric chains and its distribution in the mold and how to control molecular orientation – Parallel orientation of the drag axis – Orientation perpendicular to the drag axis – Double orientation of the axes**

6- **Mechanical properties of polymers and factors affecting them – structural factors and external factors such as heat, pressure and humidity – Additives**

7- **Devices and techniques used in the measurement and evaluation of mechanical properties**

   Tensile strength – Impact strength – Elastic modulus – Dynamic loss coefficient – Slip coefficient – Relaxation

8- **Diagnosis of industrial and commercial polymers in order to benefit from recycling and reduce pollution**

CHEM456 / Industrial distances: includes the definition of additives that are added to foodstuffs, oils and polymers, their types and the mechanism of their action.

Curriculum C456

CHEM461 / Industrial Pollution Chemistry: For the purpose of preserving the environment and natural resources in order to achieve health, well-being, sustainable development, spreading awareness and reducing industrial pollution that is destructive to the environment.

Curriculum C461

1- **General introduction to pollution**

   A brief history of international concerns in the problem of pollution - definition of pollution - pollution control law - the basic components of nature and natural balance

2- **air pollution**

   2-1- Air pollutants and their main sources - dust and its natural and industrial sources

   2.2 Pollutant Units of Measurement – Control of Sources of Pollution by Industrial Dust

   2-3 - sulfur oxides (sources, interactions, methods of controlling sources of pollution)

2-4 - carbon monoxide gas (sources, interactions, methods of controlling sources of pollution)

2-5 - nitrogen oxides (sources, interactions, methods of controlling sources of pollution)

2-6 - Hydrogen sulfide gas and methods of its removal

2-7-- Hydrocarbons and photooxidants (sources, interactions, methods of controlling sources of pollution)

2.8 Air allergens

2.9 Smoking

2.10 Stranosphere pollution

3- water pollution

3-1- Water pollution and its main sources

3-2- Crude oil water pollution

3-3- Water contamination with washing powder

3-4- Pesticide contamination of water

3-5- Water pollution with heavy metals (inorganic compounds)

3-6- Solid waste contamination and disposal methods

3-7- Water pollution by salinity

3-8- Thermal pollution