



Level	Semester	No.	Module Code	Module Name in English	اسم المادة الدراسية	Language	SSWL (hr/w)					Exam hr/sem	SSWL hr/sem	USSWL hr/sem	SWL hr/sem	ECTS	Module Type	Prerequisite Module(s) Code	
							CL (hr/w)	Lect (hr/w)	Lab (hr/w)	Pr (hr/w)	Tut (hr/w)								Semn (hr/w)
One		1	CHE-1101	Analytical chemistry I	الكيمياء التحليلية I	English	3		3			4	94	81	175	7.00	C		
		2	CHE-1102	Inorganic Chemistry I	الكيمياء اللاعضوية I	English	3				1	4	64	86	150	6.00	C		
		3	CHE-1103	Physics	الفيزياء	English	2		3				4	79	71	150	6.00	B	
		4	CHE-1104	Laboratory Sefy	المختبرية	English	2					1	4	49	26	75	3.00	B	
		5	UOT004	Human and democracy	الديمقراطية والامن المعشري	Arabic	2						4	34	16	50	2.00	S	
		6	UoT-1106	Mathematics I	الرياضيات I	English	2				1		4	49	51	100	4.00	S	
		7	UOT001	Arabic language	اللغة العربية	Arabic	2						4	34	16	50	2.00	S	
Total							16	0	6	0	1	28	403	347	750	30.00			
UGI	Two	1	CHE-1217	Analytical chemistry II	الكيمياء التحليلية II	English	3		3		1	4	109	66	175	7.00	C		
		2	CHE-1218	Inorganic Chemistry II	الكيمياء اللاعضوية II	English	3				1	4	79	71	150	6.00	C		
		3	UoT-1209	Statistic	الاحصاء	English	3				1	4	79	71	150	6.00	B		
		4	CHE-1210	Biology	علم الاحياء	English	2		3		1		4	94	56	150	6.00	B	
		5	UOT003	Computers	الحاسوب	Arabic	1		2				4	49	26	75	3.00	B	
		6	UOT002	English Language	اللغة الانكليزية	English	2						4	34	16	50	2.00	S	
		Total							14	0	8	0	4	24	444	306	750	30.00	
UGII	Three	1	CHE-23113	Gravity Analytical chemistry	الكيمياء التحليل الوزني	English	2		3			4	79	71	150	6.00	C		
		2	CHE-23114	Inorganic Chemistry III	الكيمياء اللاعضوية III	English	2		3		1	4	94	56	150	6.00	C		
		3	CHE-23115	Thermodynamic Chemistry I	كيمياء الترموديناميك I	English	2		3		1	4	94	56	150	6.00	C		
		4	CHE-23116	Organic Chemistry I	الكيمياء العضوية I	English	2		3		1	4	79	71	150	6.00	C		
		5	CHE-23118	Chemistry program	برمجيات كيمياء	English	2		2			3	63	37	100	4.00	S		
		6	UOT005	Baath Party Crimes	جرائم حزب البعث	English	2				1		3	48	12	60	2.00	B	
		Total							12	0	14	0	1	22	457	303	760	30.00	
UGIII	Four	1	CHE-24119	Separations methods	طرق الفصل	English	2		3		1	4	94	56	150	6.00	C		
		2	CHE-24120	Inorganic Chemistry IV	الكيمياء اللاعضوية IV	English	2		3		1	4	94	56	150	6.00	C		
		3	CHE-24121	Thermodynamic Chemistry II	كيمياء الترموديناميك II	English	2		3		1	4	94	66	160	6.00	C		
		4	CHE-24122	Organic Chemistry II	الكيمياء العضوية II	English	2		3		1	4	94	66	160	6.00	C		
		5	UOT031	Computers2	حاسوب ٢	Arabic	2					3	33	17	50	3.00	B		
		6	UOT021	English language	اللغة الانكليزية	English	2					3	33	17	50	2.00	S		
		7	UOT011	Arabic language 2	اللغة العربية ٢	Arabic	2					3	33	17	50	2.00	S		
Total							14	0	12	0	0	4	25	475	295	770	30.00		
UGIV	Five	1	CHE-35125	Coordination Chemistry I	الكيمياء التناسقية I	English	2		2		1	4	79	71	150	6.00	C	CHE-24120	
		2	CHE-35126	Kinetic Chemistry	الكيمياء الحركية	English	2		2		1	4	79	71	150	6.00	C	CHE-24121	
		3	CHE-35127	Organic Chemistry 3	الكيمياء العضوية III	English	2		2		1	4	79	71	150	6.00	C	CHE-24122	
		4	CHE-35128	Biochemistry 1	الكيمياء الحيوية I	English	2		2		1	4	79	71	150	6.00	C		
		5	CHE-35029	Principles of Industrial Chemistry	اسس الكيمياء الصناعية	English	2		2		1	3	48	52	100	3.00	C		
		6	CHE-35030	Petroleum Chemistry	كيمياء النفط	English	2					3	33	17	50	2.00	C		
		7	CHE-36230	Selective1	اختياري I	Arabic	2					3	33	17	50	2.00	B		
Total							14	0	8	0	3	22	397	353	750	30.00			
UGIII	Six	1	CHE-36131	Coordination Chemistry II	الكيمياء التناسقية II	English	2		2		1	4	79	71	150	6.00	C	CHE-35125	
		2	CHE-36132	Electric chemistry	الكيمياء الكهربائية	English	2		2		1	4	79	71	150	6.00	C	CHE-35126	
		3	CHE-36133	Organic chemistry 4	الكيمياء العضوية IV	English	2		2		1	4	79	71	150	6.00	C	CHE-35127	
		4	CHE-36134	Biochemistry 2	الكيمياء الحيوية II	English	2		2		1	4	79	71	150	6.00	C	CHE-35128	
		5	CHE-36135	Application of Industrial Chemistry	تطبيقات الكيمياء الصناعية	English	2		2		1	3	48	52	100	3.00	C	CHE-35029	
		6	CHE-36042	Selective2	اختياري II	Arabic	2					3	48	17	65	2.00	B		
		6	CHE-36237	Selective3	اختياري III	Arabic	2					3	48	17	65	2.00	B		
Total							12	0	8	0	0	6	22	412	353	765	28.00		
UGIV	Seven	1	CHE-47137	Instrumental analysis 2	كيمياء التحليل الالي ٢	English	2		2		1	4	79	71	150	6.00	C		
		2	CHE-47138	Organic Identification 2	التشخيص العضوي ٢	English	2		2		1	4	79	46	125	5.00	C	CHE-36133	
		3	CHE-47139	Biochemistry 3	الكيمياء الحيوية III	English	2		2		1	4	79	46	125	5.00	C	CHE-36134	
		4	CHE-47140	Industrial chemistry3	كيمياء الصناعية III	English	2		2		1	3	78	72	150	6.00	C	CHE-36135	
		5	CHE-47141	Spectroscopy chemistry	كيمياء الطيف	English	2					1	3	48	52	100	4.00	C	
		6	CHE-48148	selective 1	اختياري I	English	2					3	33	67	100	4.00	C		
		Total							12	0	8	0	0	5	21	396	354	750	30.0
UGIV	Eight	1	CHE-48143	Instrumental analysis 2	كيمياء التحليل الالي ٢	English	2		2		1	4	79	71	150	6.00	C	CHE-47137	
		2	CHE-48144	Identification 2	التشخيص العضوي ٢	English	2		2		1	4	79	46	125	5.00	C	CHE-47138	
		3	CHE-48145	Biochemistry 4	الكيمياء الحيوية IV	English	2		2		1	4	79	46	125	5.00	C	CHE-47139	
		4	CHE-48146	Industrial chemistry 4	كيمياء الصناعية IV	English	2		2		1	3	78	72	150	6.00	C	CHE-47140	
		5	CHE-48147	Quantum chemistry	كيمياء الكم	English	2					1	3	48	52	100	4.00	C	CHE-47141
		6	CHE-47048	Research project	مشروع البحث	Arabic	2		2			3	33	67	100	4.00	B		
		Total							10	0	8	0	0	5	18	363	287	650	30.0
Total							104	0	72	0	9	28	182	3347	2598	5945	238.0		Must be 240 ECTS

Note: The student should complete 4 weeks of Summer Internships to fulfill the requirements of the Bachelor's degree

Structured SWL (hr/w) type	Module type	Module type		SWL: Student Workload	SSWL: Structured SWL	USSWL: Unstructured SWL
		B	C			
CL	Class Lecture	B	Basic learning activities			
Lab	Laboratory	C	Core learning activity			
Pr	Practical Training	S	Support or related learning activity			
Tut	Tutorial	E	Elective learning activity			
Lect	Online lecture					
Semn	Seminar					

Note: Columns O, Q and R are prograamed, protected and should not be edited



## MODULE DESCRIPTOR | 2024-2025 |

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*Tikrit UNIVERSITY*

جامعة تكريت



**Bachelor of Science in Chemistry**

بكالوريوس علوم في الكيمياء

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### 1- Overview

This catalogue is about the courses (modules) given by the program of Science in Chemistry to earn the Bachelor of Science degree. The program delivers (48) Modules with (6000) total student workload hours and 240 total ECTS. The module delivery is based on the Bologna Process.

نظرة عامه

يتناول هذا الدليل المواد الدراسية التي يقدمها برنامج علوم الكيمياء للحصول على درجة بكالوريوس العلوم. يقدم البرنامج (48) مادة دراسية مع (6000) إجمالي ساعات حمل الطالب و (240) إجمالي وحدات أوروبية. يعتمد تقديم المواد الدراسية على عملية بولونيا.

### 2- Undergraduate Courses 2023-2024

1

Code	Course/Module Title	ECTS	Semester
<b>CHE-1101</b>	<b>Qualitative analytical chemistry</b>	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
4	4	109	66
Description			
<p>Analytical Chemistry is a measurement science consisting of a set of powerful ideas and methods that provide qualitative or quantitative information about the chemical composition of a sample. Analytical measurements are required in a wide range of fields beyond the chemical industry, such as biochemistry and the pharmaceutical industry, environmental sciences, forensic sciences, and the food industry, amongst others. The module will provide a classification of analytical chemistry, weight and concentration units, methods of expressing concentrations, aqueous-solution chemistry, chemical equilibrium, solubility, activity, and activity coefficient.</p>			

2

Code	Course/Module Title	ECTS	Semester
CHE 1101	Inorganic Chemistry I	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
3	2	79	71
Description			
The module includes lectures on the origin of the elements, atoms and the Periodic Table, shapes and properties of molecules, chemistry of the elements, properties of solutions, thermochemistry, thermodynamics and kinetics.			

3

Code	Course/Module Title	ECTS	Semester
CHE-1103	Physics	6	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	4	93	57
Description			
Physics is concerned with describing the interactions of energy, matter, space, and time, and it is especially interested in what fundamental mechanisms underlie every phenomenon. The concern for describing the basic phenomena in nature essentially defines the realm of physics.			

4

Code	Course/Module Title	ECTS	Semester
CHE-1104	Laboratory Safety	3	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	1	48	27
Description			
ان المختبرات الكيميائية تواجه عدداً من المخاطر منها ما يتعلق بكيفية التعامل مع المواد ومنها ما يتعلق بالأشخاص ومنها ما يتعلق بالمواد نفسها ولهذا أن تؤدي السلامة والأمن الكيميائي إلى تخفيف أو إزالة آثار هذه المخاطر. لقد تطورت ثقافة جديدة بشأن الوعي وكذلك مدى المسؤولية والتنظيم والتعليم بشأن السلامة والأمن الكيميائي داخل مختبرات الكيمياء والأكاديميات والمعاهد المنتشرة في أنحاء العالم. ولقد طورت المختبرات الكيميائية مجموعة من الإجراءات الخاصة ومجموعة من الأجهزة للتعامل مع وإدارة المواد الكيميائية بما يحقق السلامة والأمان. إن تطوير ثقافة (السلامة والأمن الكيميائي) اداء الى إقامة مختبرات تنعم ببيئة آمنة وصحية يمكن أن تتم فيها ممارسة التدريس والتعلم والعمل على حد سواء. ويمكن تعريف إجراءات السلامة داخل المختبر الكيميائي: بأنها قواعد واسس عالمية يجب أن يلتزم بها كل من يعمل في هذا المضممار حمايةً لنفسه والعاملين معه والبيئة الخارجية.			

5

Code	Course/Module Title	ECTS	Semester
UoT- 1105	Human and democracy	3	1
Class (hr/w)	Lect/Lab./Prac./Tutor	SSWL (hr/sem)	USWL (hr/sem)
2	1	48	52
Description			
<p>زيادة معرفة الطالب بالجانب المفاهيم النظري والتطور التاريخي لمادة حقوق الانسان والديمقراطية  تتمية مهارات الطالب التحليلية والنقدية فيما يتعلق بواقع ومستقبل حقوق الانسان والديمقراطية  تدريب الطالب على اهمية المشاركة الفاعلة في جوانب الحياة العامة كتعزيز احترام مبادئ حقوق الانسان العامة والمشاركة الفاعلة في  الحياة السياسية والثقافية.  تمكين الطلاب من فهم اهمية التعليم ودوره في نشر ثقافة حقوق الإنسان والديمقراطية في بناء مجتمع حضاري يقوم على أساس الحكم  الصالح الذي من اهم مقوماته الإيمان بحقوق الإنسان والتربية عليها والمشاركة الفاعلة في الحكم عبر الانتخابات الحرة والعادلة</p>			

6

Code	Course/Module Title	ECTS	Semester
UoT- 1106	Mathematics	4	1
Lectures (hr/w)	Lab./Prac./Tutor.	SSWL (hr/sem)	USSWL (hr/sem)
2	1	48	52
Description			
<p>Now that you have completed Foundation Mathematics, you will be able to study techniques that are applied to current engineering problems. This module will introduce you to the techniques you will develop further in your engineering or mathematics degree: you will learn the basics of the mathematics used in the construction of machines, buildings or satellites; develop the skills in calculus needed for basic weather forecasting and climate studies; study the mechanics used for planning the movements of objects, such as car engines, trains pulling uphill or rockets launching into space; and the trigonometry used to design communications networks, aeriels and medical treatments for diseases such as cancer.</p>			

7

Code	Course/Module Title	ECTS	Semester
CHE-1217	<b>Volumetric analytical chemistry</b>	7	2
Lectures (hr/w)	Lab./Prac./Tutor	SSWL (hr/sem)	USSWL (hr/sem)
3	4	109	71
Description			
<p>Analytical Chemistry is a measurement science consisting of a set of powerful ideas and methods that provide qualitative or quantitative information about the chemical composition of a sample. Analytical measurements are required in a wide range of fields beyond the chemical industry, such as biochemistry and the pharmaceutical industry, environmental sciences, forensic sciences, and the food industry, amongst others.</p>			

8

Code	Course/Module Title	ECTS	Semester
<b>CHE-1218</b>	Inorganic chemistry 2	6	2
Lectures (hr/w)	Lab./Prac./Tutor.	SSWL (hr/sem)	USSWL (hr/sem)
3	2	79	71
<b>Description</b>			
The module includes lectures on the origin of the elements, atoms and the Periodic Table, shapes and properties of molecules, chemistry of the elements, properties of solutions, thermochemistry, thermodynamics and kinetics.			

9

Code	Course/Module Title	ECTS	Semester
CHE-1209	Statistics	4	2
Lectures (hr/w)	Lab./Prac./Tutor.	SSWL (hr/sem)	USSWL (hr/sem)
2	1	63	37
<b>Description</b>			
The module is intended as a first course in random variables and distributions for students studying a degree in which mathematics is to be the main subject throughout that degree as it provides a good foundation to higher level probability and statistics modules. The module assumes that a student will be competent in basic probability rules of events. Topics include: exploring features of a wide range of discrete and continuous random variables; evaluating probabilities for a specified probability distribution by calculation and by using statistical software; defining and determining generating functions for random variables, i.e. the probability generating function, the moment generating function and the cumulant generating function			

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Code	Course/Module Title	ECTS	Semester
CHE-12010	Physic	6	2
Lectures (hr/w)	Lab./Prac./Tutor.	SSWL (hr/sem)	USSWL (hr/sem)
2	3	93	57
<b>Description</b>			
The aim of this module is for the student to understand and gain experience of the application and delivery of a range of core and specialised methods and techniques and to understand their importance in the clinical investigation of patients			

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Code	Course/Module Title	ECTS	Semester
<b>CoS- 12011</b>	computer program 1	3	2
Lectures (hr/w)	Lab./Prac./Tutor(hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
0	3	48	27
Description			
This course introduces fundamental computing principles and programming concepts. Students use the high-level programming language,			

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Code	Course/Module Title	ECTS	Semester
UoT- 12012	Arabic language	3	2
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	1	48	27
Description			
توضيح أهمية اللغة العربية وفوائدها بالنسبة للطلاب الجامعي			

13

Code	Course/Module Title	ECTS	Semester
<b>CHE-23113</b>	<b>Gravity analytical chemistry</b>	6	3
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	3	79	71
Description			
The module includes lectures on the origin of the elements, atoms and the Periodic Table, shapes and properties of molecules, chemistry of the elements, properties of solutions, thermochemistry, thermodynamics and kinetics.			

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Code	Course/Module Title	ECTS	Semester
<b>CHE-23114</b>	Inorganic chemistry 3	6	3
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	94	56
Description			
The module includes lectures on the origin of the elements, atoms and the Periodic Table, shapes and properties of molecules, chemistry of the elements, properties of solutions, thermochemistry, thermodynamics and kinetics.			

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Code	Course/Module Title	ECTS	Semester
<b>CHE-23115</b>	Physical chemistry 1	6	3
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	94	56
Description			
The student should acquire a broad understanding of the knowledge base in Physical Chemistry and its terminology or discourse. They will operate in a range of varied but predictable contexts that require the use of a specified range of techniques and information sources. Additionally, the student will be required to identify principles and concepts underlying theoretical frameworks.			

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Code	Course/Module Title	ECTS	Semester
<b>CHE-23116</b>	organic chemistry 1	6	3
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	94	56
Description			
To introduce students to the basic concepts of organic chemistry (to encompass the structure of organic compounds, isomerism, the concept of a functional group and the unifying concepts of mechanism) in order to provide the foundation for treatment at a greater depth in later modules or to better appreciate related subjects such as Biochemistry and Medicinal Chemistry.			

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Code	Course/Module Title	ECTS	Semester
<b>CoS- 23118</b>	Mathematics II	3	3
Lectures (hr/w)	Lab./Prac./Tutor/Sem (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	1	48	27

Description
This course introduces fundamental computing principles and programming concepts. Students use the high-level programming language,

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Code	Course/Module Title	ECTS	Semester
<b>CoS- 23117</b>	COMPUTER PROGRAM II	3	3
Lectures (hr/w)	Lab./Prac./Tutor(hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
0	3	48	27
Description			
This course introduces fundamental computing principles and programming concepts. Students use the high-level programming language,			

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Code	Course/Module Title	ECTS	Semester
<b>CHE-35125</b>	<b>Coordination chemistry 1</b>	6	5
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	79	71
Description			
This course introduces knowledge essential to the understanding of coordination chemistry. Following this, Theories related to metal complexes including VB, CFT, MO theories. These topics lead to a description of molecular structures including 4 and 6 coordination number complexes.			

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Code	Course/Module Title	ECTS	Semester
<b>CHE-35126</b>	<b>Kinetic chemistry</b>	6	5
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	94	56
Description			
يصف الكورس الى تعريف الطلبة ما هي الكيمياء الفيزيائية الحركية والكهربائية وكيف يمكن ان يتبع الطالب التفاعلات وما يحدث خلال التفاعل في فترات زمنية مختلفة وعند درجة حرارة ثابتة ومختلفة كما يصف الكورس الى تعريف الطالب ماهو الكم وفوائده للطلاب الكيميائي واهمية الدراسة النظرية والحسابية للكيميائي ووصف البرنامج التعليمي بشكل حسابي			

وكما يصف تعريف الطيف الجزيئي وكيفية معرفة مناطق الطيف المغناطيسي وإيجاد المجهول منها وتشخيص المركب الكيميائي لكل منطقة من من مناطق الطيف بطريقة حسابية .

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Code	Course/Module Title	ECTS	Semester
<b>CHE-35127</b>	<b>Organic chemistry 3</b>	6	5
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	94	56
Description			
<p>A vital aim of organic chemistry is to be able to synthesize biologically active molecules. With this in mind, you will explore some of the most important organic reactions used in research laboratories. These reactions, along with those introduced in earlier modules, are then studied in the laboratory. Having been introduced to modern spectroscopic methods for determining the structures of organic molecules, these techniques are then used to identify the compounds which have been prepared in the laboratory. Aromatic compounds are central to the structure of a vast number of important organic molecules and the chemistry of these species will also be studied.</p>			

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Code	Course/Module Title	ECTS	Semester
<b>CHE-35128</b>	<b>Biochemistry</b>	6	5
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	79	71
Description			
<p>The study of biochemistry shows how organic compounds present in living organisms interact to maintain and perpetuate life. In this brief introduction, we will describe the milestones in the history of biochemistry, the different branches of the field, the attributes of living organisms, and the various elements that comprise living organisms</p>			

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Code	Course/Module Title	ECTS	Semester
<b>CHE-35129</b>	<b>Industrial chemistry 1</b>	4	5
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	1	48	52
Description			

This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.

31

Code	Course/Module Title	ECTS	Semester
<b>CHE-36131</b>	<b>Coordination chemistry 2</b>	6	6
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	79	71
Description			
This course introduces knowledge essential to the understanding of Stability of transition metal complexes. Following this, Factors affection the stability of metal complexes. Also, the introductory of Reaction mechanism and magnetic properties of metal complexes.			

32

Code	Course/Module Title	ECTS	Semester
<b>CHE-36132</b>	<b>Electrochemistry</b>	6	6
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	79	71
Description			
This module will build on the material covered by the Physical Chemistry 1 module. By the end of this module, students should have a deeper understanding of thermodynamics, including statistical thermodynamics. This module will also introduce students to electrochemistry, quantum mechanics, colloids and physical chemistry at surfaces and interfaces			

33

Code	Course/Module Title	ECTS	Semester
<b>CHE-36133</b>	<b>Organic chemistry 3</b>	6	6
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	79	71
Description			
A vital aim of organic chemistry is to be able to synthesize biologically active molecules. With this in mind, you will explore some of the most important organic reactions used in research laboratories.			

These reactions, along with those introduced in earlier modules, are then studied in the laboratory. Having been introduced to modern spectroscopic methods for determining the structures of organic molecules, these techniques are then used to identify the compounds which have been prepared in the laboratory. Aromatic compounds are central to the structure of a vast number of important organic molecules and the chemistry of these species will also be studied.

34

Code	Course/Module Title	ECTS	Semester
<b>CHE-36134</b>	<b>Biochemistry 2</b>	6	6
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	79	71
Description			
The study of biochemistry shows how organic compounds present in living organisms interact to maintain and perpetuate life. In this brief introduction, we will describe the milestones in the history of biochemistry, the different branches of the field, the attributes of living organisms, and the various elements that comprise living organisms			

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Code	Course/Module Title	ECTS	Semester
<b>CHE-36135</b>	<b>Industrial chemistry 2</b>	4	6
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	1	48	52
Description			
This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.			

37

Code	Course/Module Title	ECTS	Semester
<b>CHE-36137</b>	<b>Instrumental analysis 1</b>	6	7
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	3	79	71

Description
This module presents a review of standardisation and use of commoner reagents in acid/base, redox, precipitation and complexation reactions It will also offer an Introduction to gravimetry, principles, instrumentation and applications of UV/VIS, IR and atomic absorption spectrometry as well as a comparative overview of methods.

38

Code	Course/Module Title	ECTS	Semester
<b>CHE-36138</b>	<b>Organic identification 1</b>	5	7
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	3	79	48

Description

- تزويد الطلبة بالأساسيات والمواضيع الإضافية المتعلقة بمخرجات التفكير والتحليل الكيميائي العضوي. تكوين مجموعات نقاشيه خلال المحاضرات لمناقشة مواضيع الكيمياء العضوية تتطلب التفكير والتحليل. -طلب حل مجموعة من الاسئلة التفكيرية خلال المحاضرات مثل ماذا وكيف ومتى ولماذا لمواضيع محددة - اعطاء الطلبة واجبات بيته تتطلب تفسيرات ذاتيه بطرق سببيه.

39

Code	Course/Module Title	ECTS	Semester
<b>CHE-36139</b>	<b>Biochemistry 3</b>	5	7
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	3	79	46

Description

Life is driven by biochemical reactions. Biochemistry is an introductory module providing the essentials for understanding all living processes. You will study protein structure, enzyme kinetics and basic metabolism; understanding how each of these processes function and shape the living cell. Practical sessions offer you vital hands-on experience, learning key techniques and how to apply them. Core biochemical experience is highly relevant to applications in biotechnology and medical science. This module provides the foundation from which you may progress to higher level modules in Metabolism, Analytical Techniques in Biochemistry, Bioinorganic Chemistry, and Pharmacology and Medicinal Chemistry.

40

Code	Course/Module Title	ECTS	Semester
<b>CHE-36140</b>	<b>Industrial chemistry 3</b>	6	7
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	3	78	72

Description
This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.

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Code	Course/Module Title	ECTS	Semester
<b>CHE-36141</b>	<b>SPECTROSCOPY CHEMISTRY</b>	4	7
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	1	48	52

## Description

This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.

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Code	Course/Module Title	ECTS	Semester
<b>CHE-48143</b>	<b>INSTRUMENTAL ANALYSIS 1</b>	6	8
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	4	79	71

## Description

This module presents a review of standardisation and use of commoner reagents in acid/base, redox, precipitation and complexation reactions It will also offer an Introduction to gravimetry, principles, instrumentation and applications of UV/VIS, IR and atomic absorption spectrometry as well as a comparative overview of methods. In addition, the module will include coverage of the following: application of Beer's Law to calibration and to mixtures, brief introduction to principles of chromatography and sorption processes - partition, ion exchange etc, columns, detector types, mobile and stationary phases, outline of high performance liquid chromatography, qualitative and quantitative analysis

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Code	Course/Module Title	ECTS	Semester
<b>CHE-48144</b>	<b>Organic identification 1</b>	5	8
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)

2	3	79	48
Description			
- تزويد الطلبة بالأساسيات والمواضيع الإضافية المتعلقة بمخرجات التفكير والتحليل الكيميائي العضوي. تكوين مجموعات نقاشيه خلال المحاضرات لمناقشة مواضيع الكيمياء العضوية تتطلب التفكير والتحليل. - طلب حل مجموعة من الاسئلة التفكيرية خلال المحاضرات مثل ماذا وكيف ومتى ولماذا لمواضيع محددة. - اعطاء الطلبة واجبات بيثيه تتطلب تفسيرات ذاتيه بطرق سببيه.			

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Code	Course/Module Title	ECTS	Semester
<b>CHE-48145</b>	<b>Biochemistry 3</b>	5	8
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	3	79	46
Description			
Life is driven by biochemical reactions. Biochemistry is an introductory module providing the essentials for understanding all living processes. You will study protein structure, enzyme kinetics and basic metabolism; understanding how each of these processes function and shape the living cell. Practical sessions offer you vital hands-on experience, learning key techniques and how to apply them. Core biochemical experience is highly relevant to applications in biotechnology and medical science.			

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Code	Course/Module Title	ECTS	Semester
<b>CHE-36146</b>	<b>Industrial chemistry 4</b>	6	8
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	3	78	72
Description			
This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.			

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Code	Course/Module Title	ECTS	Semester
<b>CHE-36147</b>	<b>QUANTUM CHEMISTRY</b>	4	8
Lectures (hr/w)	Lab./Prac./Tutor (hr/w)	SSWL (hr/sem)	USSWL (hr/sem)
2	1	48	52

**Description**

This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.

# MODULE DESCRIPTOR | 2024-2025 |

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*Tikrit UNIVERSITY*

جامعة تكريت



**Bachelor of Science in Chemistry**

بكالوريوس علوم في الكيمياء





Ministry of Higher Education and  
Scientific Research - Iraq  
University of Tikrit  
College of Science  
Department of Chemistry



## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Qualitative analytical chemistry		Module Delivery
Module Type	CORE		Theory Lab. Tutorial Seminar
Module Code	CHE-1101		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	1	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Fadum M. Abdoon Dr. Mustafa Q. Jabbar	e-mail	
Module Leader's Acad. Title	Assist. Prof. Lect.	Module Leader's Qualification	Ph.D. Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	-	<b>Semester</b>	-
<b>Co-requisites module</b>	-	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	<p>The purpose of this course is to introduce learners to the basics of Analytical Chemistry, a branch of Chemistry that deals with the analysis of real samples using various analytical techniques in order to determine the identity and quantity of substances of interest in a sample. Analytical Chemistry 1 requires some level of integrative understanding over and above minimal and descriptive understanding. Students at this level are required to apply knowledge obtained in the course to familiar contexts by sometimes explaining and analyzing data.</p>		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>The intended subject-specific learning outcomes.</p> <ol style="list-style-type: none"> <li>1. On successfully completing the module, students will be able to:</li> <li>2. Demonstrate an understanding of key concepts in Analytical Chemistry. Solve quantitative problems relating to these concepts.</li> <li>3. Suggest appropriate methods to solve analytical tasks.</li> </ol> <p>The intended generic learning outcomes.</p> <ol style="list-style-type: none"> <li>4. On successfully completing the module, students will be able to:</li> <li>5. Demonstrate the development of practical/technical skills</li> <li>6. Analyze, evaluate, and correctly interpret data, Communicate and present data effectively</li> <li>7. Obtain and use information from various sources as part of self-directed learning.</li> <li>8. Manage their time and use their organization skills within the context of self-directed learning.</li> </ol>		
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• Fundamentals of analytical chemistry</li> <li>• Fundamentals of Concentration units</li> <li>• Solution chemistry and Electrolyte</li> <li>• Acid and base chemistry</li> <li>• Chemical equilibrium</li> <li>• Activity and Ionic strength</li> </ul>		

<b>Course Description</b>	Analytical Chemistry is a measurement science consisting of a set of powerful ideas and methods that provide qualitative or quantitative information about the chemical composition of a sample. Analytical measurements are required in a wide range of fields beyond the chemical industry, such as biochemistry and the pharmaceutical industry, environmental sciences, forensic sciences, and the food industry, amongst others. The module will provide a classification of analytical chemistry, weight and concentration units, methods of expressing concentrations, aqueous-solution chemistry, chemical equilibrium, solubility, activity, and activity coefficient.
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	<b>109</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>7.2</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	<b>66</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>4.4</b>
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	125		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	3	10% (10)		
	<b>Assignments</b>	2	5 % (5)		
	<b>Lab</b>	6	15% (15)		
	<b>Tut.</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	General introduction
Week 2	Classification of analytical chemistry
Week 3	Weight and concentration Units
Week 4	Aqueous -solution chemistry, Electrolytes and classification of electrolytes
Week 5	Acid - base theories
Week 6	Amphiprotic Species
Week 7	Midterm exam
Week 8	Chemical equilibrium
Week 9	Equilibrium constants
Week 10	Formation constant of complex
Week 11	Multistep equilibrium types
Week 12	Effect of common ion
Week 13	Effect of complex formation on solubility
Week 14	and activity coefficient
Week 15	Ionic strength
Week 16	<b>Final Exam</b>



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Department of Chemistry



## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	INORGANIC CHEMISTRY 1		Module Delivery
Module Type	CORE		Theory Tutorial Seminar
Module Code	CHE-1102		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Ahmed S. Fihan Dr. Anwar Adil Hameed	e-mail	a-s.fehan@tu.edu.iq
Module Leader's Acad. Title	Professor Lect.	Module Leader's Qualification	Ph.D. Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	None	<b>Semester</b>	-
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	The module aims to provide the students with an understanding of the fundamental principles of Inorganic Chemistry ( such as atomic structure, and the development of the atom discovery) to act as a foundation in chemistry area.		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ Students should be able to describe the fundamental principles of atomic structure and give the electronic structures of atoms and their quantum numbers.</li> <li>✓ Students should appreciate how the electronic structure of atoms leads to the build-up of the periodic table.</li> <li>✓ Students should be able to know electromagnetic radiation and black body radiation</li> <li>✓ Students should have an understanding the quantum theory.</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ul style="list-style-type: none"> <li>✓ Fundamentals of atomic structure (6 hrs)</li> <li>✓ Historical development of atom discovery (10 hrs)</li> <li>✓ Fundamentals of electromagnetic radiation (10 hrs)</li> <li>✓ Quantum theory (12 hrs)</li> <li>✓ Case studies in inorganic chemistry (6 hrs)</li> </ul>		
<b>Course Description</b>	The module includes lectures on the origin of the elements, atoms and the Periodic Table, shapes and properties of molecules, chemistry of the elements, properties of solutions, thermochemistry, thermodynamics and kinetics.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.2
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	15% (15)		
	<b>Seminars</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	15% (15)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fundamentals of atomic structure
Week 2	Historical development of atom discovery
Week 3	Historical development of atom discovery continued
Week 4	Lewis dot theory
Week 5	Lewis's structures
Week 6	Bohr Model of atom
Week 7	Electromagnetic radiation
Week 8	Electromagnetic radiation continued
Week 9	Midterm exam
Week 10	Electromagnetic radiation continued
Week 11	Black body radiation
Week 12	Black body radiation continued
Week 13	Quantum Theory
Week 14	Quantum Theory
Week 15	Quantum Theory continued
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Inorganic Chemistry by Duward Shriver, Mark Weller, Tina Overton, Fraser Armstrong, Jonathan Rourke, 6 <sup>th</sup> edition, W. H. Freeman (2014).	Yes (Online)
Recommended Texts		
Websites	<a href="https://archive.org/details/inorganic-chemistry-atkins-shriver-pdf">https://archive.org/details/inorganic-chemistry-atkins-shriver-pdf</a>	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Physics الفيزياء		Module Delivery
Module Type	BASIC		Theory Lab Tutorial
Module Code	CHE- 1103		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester (s) offered	1
Administering Department	Chemistry	College	Science
Module Leader	Dr. Hussein K. Mohammad	e-mail	hussienalkhalid@yahoo.com
Module Leader's Acad. Title	Lecture	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	-	<b>Semester</b>	-
<b>Co-requisites module</b>	-	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	Physical Sciences promotes knowledge and skills in scientific inquiry and problem solving; the construction and application of scientific and technological knowledge; an understanding of the nature of science and its relationships to technology, society and the environment.		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	The students should be able to solve and find an appropriate solutions for general physical problems that they face.		
<b>Indicative Contents</b> المحتويات الإرشادية	Aspects of Physics including vectors, energy, electricity, magnetism, and force. Assessment will contain Lab based experimental work.		
<b>Course Description</b>	Physics is concerned with describing the interactions of energy, matter, space, and time, and it is especially interested in what fundamental mechanisms underlie every phenomenon. The concern for describing the basic phenomena in nature essentially defines the realm of physics.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	<b>93</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>6.2</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	<b>57</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>3.8</b>
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	3	10% (10)		
	<b>Assignments</b>	2	5 % (5)		
	<b>Lab</b>	6	15% (15)		
	<b>Tut.</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)		
	<b>Final Exam</b>	3	50% (50)		
<b>Total assessment</b>			<b>100% (100 Marks)</b>		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Measurement, Dimensions, Units of measurement, Measurement systems
Week 2	Dimensional analysis
Week 3	Vectors and their compounds, Unit vectors
Week 4	Vector Addition, Multiplication of Vectors
Week 5	Linear motion in one dimension
Week 6	Force and its types
Week 7	Midterm exam
Week 8	Newton's laws of motion
Week 9	Equilibrium, Work, Energy and Power
Week 10	Material properties (Density, Elasticity and Hooke's law)
Week 11	Electrostatics (Coulomb's law, Electric field)
Week 12	Electrostatics (Coulomb's law, Electric field)
Week 13	Capacitors, Electric current
Week 14	Ohm's law & Electric potential
Week 15	Magnetism (Magnetic fields, Biot-Savart's law, and Ampere's law)
Week 16	<b>Final Exam</b>

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of physics Halliday, D., Resnick, R., & Walker, J. (2013). . John Wiley & Sons.	No
Recommended Texts		No
Websites	.	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	LABORATORY SAFETY السلامة والامن الكيميائي		Module Delivery
Module Type	<b>BASIC</b>		Theory tutorial Seminar
Module Code	<b>CHE-1104</b>		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	1	Semester (s) offered	1
Administering Department	Chemistry	College	Science
Module Leader		e-mail	
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	-	Semester	-
Co-requisites module	-	Semester	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description			
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	التعرف على المفاهيم الأساسية للسلامة المختبرية ومعرفة الاشارات المختبرية وقراءة بطاقات السلامة المختبرية بطريقة صحيحة		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<p>بعد الانتهاء من المقرر يتعلم الطالب</p> <ol style="list-style-type: none"> <li>1. التعرف على اهمية السلامة المختبرية واهدافها وقواعدها</li> <li>2. التعرف على تجهيزات السلامة في المختبرات الكيميائية</li> <li>3. التعرف على القواعد العامة للسلامة الكيميائية</li> <li>4. التعرف على كيفية التعامل مع الكيماويات واثارات السلامة وبطاقات السلامة (MSDS)</li> <li>5. التعرف على انواع المخاطر الكيميائية واضرارها وطرق الوقاية منها</li> <li>6. التعرف على النفايات الكيميائية وانواعها والطرق السليمة لمعالجتها والتخلص منها</li> <li>7. التعرف على كيفية حفظ وتخزين المواد الكيميائية</li> <li>8. التعرف على الاسعافات الاولية ومحتوى صندوق الاسعافات الاولية</li> <li>9. التعرف على مصطلح الامن الكيميائي ومتطلباته</li> </ol>		
Indicative Contents المحتويات الإرشادية			
Course Description	<p>ان المختبرات الكيميائية تواجه عدداً من المخاطر منها ما يتعلق بكيفية التعامل مع المواد ومنها ما يتعلق بالأشخاص ومنها ما يتعلق بالمواد نفسها ولهذا أن تؤدي السلامة والأمن الكيميائي إلى تخفيف أو ازالة آثار هذه المخاطر. لقد تطورت ثقافة جديدة بشأن الوعي وكذلك مدى المسؤولية والتنظيم والتعليم بشأن السلامة والأمن الكيميائي داخل مختبرات الكيميائية والأكاديميات والمعاهد المنتشرة في أنحاء العالم. ولقد طورت المختبرات الكيميائية مجموعة من الإجراءات الخاصة ومجموعة من الأجهزة للتعامل مع وإدارة المواد الكيميائية بما يحقق السلامة والأمان. إن تطوير ثقافة ( السلامة والأمن الكيميائي ) اداء الى إقامة مختبرات تنعم ببيئة آمنة وصحية يمكن أن تتم فيها ممارسة التدريس والتعلم والعمل على حد سواء. ويمكن تعريف إجراءات السلامة داخل المختبر الكيميائي: بأنها قواعد واسس عالمية يجب أن يلتزم بها كل من يعمل في هذا المضمار حمايةً لنفسه والعاملين معه والبيئة الخارجية.</p>		
Learning and Teaching Strategies			
استراتيجيات التعلم والتعليم			
Strategies	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	<b>48</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>3.2</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	<b>27</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>1.8</b>
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>75</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	3	10% (10)		
	<b>Assignments</b>	2	15 % (15)		
	<b>Tut.</b>	2	15% (15)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	السلامة المختبرية(التعريف-الانواع-الاهداف-)
Week 2	السلامة الكيميائية -المتطلبات -التجهيزات المختبرية والشخصية -اشارات وبطاقات السلامة(MSDS)
Week 3	المخاطر الكيميائية
Week 4	متطلبات السلامة عند اجراء التجارب
Week 5	متطلبات السلامة عند التعامل مع(الزجاجيات )
Week 6	متطلبات السلامة عند التعامل مع ( المعدات -الاجهزة)
Week 7	Midterm exam
Week 8	متطلبات السلامة عند التعامل مع النفايات المختبرية
Week 9	متطلبات السلامة عند التعامل مع النفايات المختبرية
Week 10	متطلبات السلامة عند(نقل- خزن-حفظ)المواد الكيميائية
Week 11	الحرائق(انواعها-وسائل اطفائها) -متطلبات السلامة عند حدوث الحرائق
Week 12	-الطفايات وانواعها
Week 13	الاسعافات الاولية
Week 14	الامن الكيميائي
Week 15	متطلبات السلامة عند الانتهاء من المختبر
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	✓	Yes
Recommended Texts		No
Websites	.	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	HUMAN AND DEMOCRACY الديمقراطية وحقوق الانسان		Module Delivery
Module Type	<b>SUPPLEMENT</b>		Theory Seminar
Module Code	UoT- 1105		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader		e-mail	
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	-	<b>Semester</b>	-
<b>Co-requisites module</b>	-	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	التعرف على مبادئ حقوق الانسان والمواثيق الدولية ومفهوم الديمقراطية واسس تحقيق الديمقراطية		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>بعد الانتهاء من المقرر يتعلم الطالب</p> <ul style="list-style-type: none"> <li>- مفهوم الديمقراطية ومميزاتها ونشأتها .</li> <li>- الاسس العامة للنظام الديمقراطي</li> <li>- الركائز الاساسية للديمقراطية</li> <li>- الانتخابات وتفصيلها العامة</li> <li>- الفساد الاداري وطرق معالجته</li> <li>- معرفة بعض المصطلحان السياسية السائدة</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>			
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب					
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل		<b>48</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً		<b>7.2</b>
<b>In class lectures</b>	<b>30</b>				
<b>In class tests</b>	<b>5</b>				
<b>Seminars</b>	<b>4</b>				
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل		<b>52</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً		<b>4.4</b>
<b>Library, dorm, home memorizing</b>	<b>30</b>				
<b>Preparation for tests</b>	<b>20</b>				
<b>Homework's</b>	<b>16</b>				
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل		<b>125</b>			

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	3	10% (10)	5, 10, 12, 14	LO #1, 2, 3, and 4
	<b>Assignments</b>	2	5 % (5)	2, 4, 6, 8, 10, 12	LO # 1, 2, 3, 4, 5 and 6
	<b>Lab</b>	6	15% (15)		
	<b>Tut.</b>	2	10% (10)	Continuous	
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)	7	LO # 1-3
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	تعريف الديمقراطية، مفهوم الديمقراطية، مميزات الديمقراطية، التطور التاريخي للديمقراطية والحرية في العصور التاريخية القديمة
Week 2	العلاقة بين الحقوق والحريات العامة للأفراد والديمقراطية، الفرق بين الحرية تقيم النظام الديمقراطي ومراحل تطبيقه في العراق
Week 3	انواع الديمقراطية.
Week 4	الشروط العامة لنجاح النظام الديمقراطي.
Week 5	مكونات وركائز الديمقراطية
Week 6	مفهوم الانتخابات وتكيفها القانوني
Week 7	Midterm exam
Week 8	الادارة الانتخابية، المبادئ العامة للإدارة الانتخابية، نظم الانتخابات، نظام الاغلبية والتمثيل النسبي
Week 9	الديمقراطية في العراق
Week 10	ايجابيات النظام الديمقراطي، سلبيات النظام الديمقراطي، مراحل النظام الديمقراطي في العراق، اهم مواد الدستور العراقي 2005م في مجال الديمقراطية وحقوق الانسان
Week 11	الفساد الاداري مفهومه و تعريفه،
Week 12	انواع الفساد، اسباب الفساد، معالجات الفساد
Week 13	بعض المصطلحات السياسية
Week 14	بعض المصطلحات السياسية(العلمانية ، الارستقراطية، الليبرالية).
Week 15	بعض المصطلحات السياسية( البيروقراطية، المعاهدات، الامبريالية).
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1- الانسان في القران الكريم . 1996، عباس محمود العقاد . 2- تاريخ نشأة مفاهيم حقوق الانسان ، 2006 ، راند سليمان الفقير. 3- حقوق الإنسان والديمقراطية والحريات العامة د. ماهر صبري كاظم	Yes
Recommended Texts		No
Websites	.	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	MATHEMATICS I الرياضيات I		Module Delivery
Module Type	<b>BASIC</b>		Theory Tutorial Seminar
Module Code	UoT- 1106		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader		e-mail	
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	-	<b>Semester</b>	-
<b>Co-requisites module</b>	-	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	Mathematics is fundamental to the study of chemistry. This course aims to introduce the concepts of calculus, complex numbers, vectors, linear algebra and statistics		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ knowledge of key ideas related to mathematics in the chemistry department</li> <li>✓ knowledge of the National Curriculum for mathematics and the way in which it facilitates the development of mathematical understanding</li> <li>✓ an understanding of the way in which theory informs practice and vice versa</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	Now that you have completed Foundation Mathematics, you will be able to study techniques that are applied to current engineering problems. This module will introduce you to the techniques you will develop further in your engineering or mathematics degree: you will learn the basics of the mathematics used in the construction of machines, buildings or satellites; develop the skills in calculus needed for basic weather forecasting and climate studies; study the mechanics used for planning the movements of objects, such as car engines, trains pulling uphill or rockets launching into space; and the trigonometry used to design communications networks, aerials and medical treatments for diseases such as cancer.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب				
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل		<b>63</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>4.2</b>
<b>In class lectures</b>	<b>30</b>			
<b>In class tests</b>	<b>5</b>			
<b>Seminars</b>	<b>4</b>			
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل		<b>37</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>2.5</b>
<b>Library, dorm, home memorizing</b>	<b>30</b>			
<b>Preparation for tests</b>	<b>20</b>			
<b>Homework's</b>	<b>16</b>			
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل		<b>125</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	3	10% (10)		
	<b>Assignments</b>	2	10% (10)		
	<b>Semn.</b>	2	10% (10)		
	<b>Tut.</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	functions, graph of function, continuous function
Week 2	odd and even functions, Invers of functions
Week 3	Limits, find the limits for real functions .
Week 4	Derivative , Derivative for Transcendental functions, chain rule, partial derivative , Exponential Functions, Logarithmic functions and chemical application of these functions
Week 5	Trigonometric functions
Week 6	Derivative of trigonometric functions
Week 7	Midterm exam
Week 8	The invers of trigonometric function, derivative of trigonometric functions
Week 9	Hyperbolic function , properties of hyperbolic functions, derivative of hyperbolic function
Week 10	Method of Integration
Week 11	Application of integration .
Week 12	Gamma And Beta function, Transitive number .
Week 13	series, Convergent Series, Ratio and Root test .
Week 14	Series of Taylor and Maclaurin
Week 15	Lopital Rotes for finding limits
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	✓ SCHAUM'S advanced calculus ✓ حسابان التفاضل والتكامل / تأليف د. صبري العاني	
Recommended Texts		No
Websites	.	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Volumetric analytical chemistry		Module Delivery
Module Type	CORE		Theory Lab. Tutorial Seminar
Module Code	CHE-1217		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	1	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Fadum M. Abdoon Dr. Mustafa Q. Jabbar	e-mail	
Module Leader's Acad. Title	Assist. Prof. Lect.	Module Leader's Qualification	Ph.D. Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

## Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

<b>Prerequisite module</b>	CHE-1101	<b>Semester</b>	1
<b>Co-requisites module</b>	-	<b>Semester</b>	-

## Module Aims, Learning Outcomes, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

<p><b>Module Aims</b> أهداف المادة الدراسية</p>	<p>The purpose of this course is to introduce learners to the basics of Analytical Chemistry, a branch of Chemistry that deals with the analysis of real samples using various analytical techniques in order to determine the identity and quantity of substances of interest in a sample. Analytical Chemistry 1 requires some level of integrative understanding over and above minimal and descriptive understanding. Students at this level are required to apply knowledge obtained in the course to familiar contexts by sometimes explaining and analyzing data.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p>The intended subject-specific learning outcomes.</p> <p>identify quality of experimental measurements.</p> <ol style="list-style-type: none"> <li>1. explain the confidence level and confidence limit.</li> <li>2. identifies the detection limit.</li> <li>3. interprets statistical tests.</li> <li>4. describe the salts and the buffer solutions</li> </ol> <p>define the different gravimetric methods.</p> <ol style="list-style-type: none"> <li>1. defines the properties of precipitate and precipitating reagent.</li> <li>2. uses the gravimetric calculations.</li> <li>3. interpret the complexometric titrations.</li> <li>4. interpret the redox titrations.</li> </ol> <p>express the titrimetric analysis methods.</p> <ol style="list-style-type: none"> <li>1. expresses the terms such as standard solution, titration, back titration, equivalence point, end point, primary and secondary standard.</li> <li>2. solves volumetric calculations.</li> <li>3. defines the gravimetric titrimetry.</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• Fundamentals of volumetric analytical chemistry</li> <li>• Fundamentals of titration methods</li> <li>• Buffer solution</li> </ul>
<p><b>Course Description</b></p>	<p>Analytical Chemistry is a measurement science consisting of a set of powerful ideas and methods that provide qualitative or quantitative information about the chemical composition of a sample. Analytical measurements are required in a wide range of fields beyond the chemical industry, such as biochemistry and the pharmaceutical industry, environmental sciences, forensic sciences, and the food industry, amongst others.</p>

## Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

<b>Strategies</b>	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems
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<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	<b>109</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>7.2</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	<b>66</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>4.4</b>
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>125</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية						
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>	
<b>Formative assessment</b>	<b>Quizzes</b>	3	10% (10)			
	<b>Assignments</b>	2	5 % (5)			
	<b>Lab</b>	6	15% (15)			
	<b>Tut.</b>	2	10% (10)			
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)			
	<b>Final Exam</b>	3	50% (50)	16	All	
<b>Total assessment</b>			100% (100 Marks)			

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Volumetric Methods of Analysis
Week 2	Calculating the pH of weak acids and base solutions
Week 3	Calculating the pH of salts solutions
Week 4	Salt differential from strong acid or weak acid and strong base
Week 5	Salt differential from strong acid or weak acid and weak base
Week 6	Buffer solutions
Week 7	Midterm exam
Week 8	Buffer capacity and Acid – Base Titration
Week 9	<b>Selection of suitable indicator or choice of indicator</b>
Week 10	Differential titration
Week 11	Calculation the concentration of pieces of weak acids in known pH
Week 12	Precipitation titrations
Week 13	Complexometric titration
Week 14	Oxidation/reduction reactions
Week 15	Oxidation-Reduction Titration
Week 16	<b>Final Exam</b>

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>✓ Doulas A.,Skoog , <a href="#">Donald M. West</a>, F. James, <a href="#">Stanley R. Crouch</a>, Fundamentals of Analytical Chemistry Brooks/Cole, Cengage, Learning,9Edn.,2014,New, York,1090 p</li> <li>✓ Daniel C. Harris, Quantitative Chemical Analysis, 7 Edition, 2007,published by W. H. Freeman and Company, New York</li> <li>✓ Gary D. Christian,Purnendu K. Dasgupta and Kevin A. Schug , Analytical Chemistry, 6th Edition, 2004, John Wiley and Sons, Inc</li> </ul>	
<b>Recommend ed Texts</b>		No
<b>Websites</b>	.	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
<b>Module Title</b>	INORGANIC CHEMISTRY 2		<b>Module Delivery</b>
<b>Module Type</b>	CORE		Theory Tutorial Seminar
<b>Module Code</b>	CHE-1218		
<b>ECTS Credits</b>	6		
<b>SWL (hr/sem)</b>	150		
<b>Module Level</b>	1	<b>Semester (s) offered</b>	
<b>Administering Department</b>	Chemistry	<b>College</b>	Science
<b>Module Leader</b>	Dr. Hayfa M. Jirjes Dr. Ahmed S. Fihan	<b>e-mail</b>	a-s.fehan@tu.edu.iq
<b>Module Leader's Acad. Title</b>	Professor Lect.	<b>Module Leader's Qualification</b>	Ph.D. Ph.D.
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>		<b>e-mail</b>	
<b>Review Committee Approval</b>	05/06/2023	<b>Version Number</b>	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	CHE-1102	<b>Semester</b>	-
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	The module aims to provide the students with an understanding of the fundamental principles of Inorganic Chemistry ( such as Periodic properties, and the bonding theories) to act as a foundation in chemistry area.		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ Students should be able to describe the Periodic properties of the elements.</li> <li>✓ Students should appreciate how the bonding in molecules and covalent bonding are formed.</li> <li>✓ Students should be able to know the VBT, MOT, and VESPR</li> <li>✓ Students should have an understanding these theories.</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ul style="list-style-type: none"> <li>- Periodic properties</li> <li>- Bonding in Molecules Covalent Bonding</li> <li>- Valence Bond Theory (V.B.T), examples and questions about VBT.</li> <li>- Molecular Orbital Theory, MOT of Diatomic Molecules.</li> <li>- VESPR theory, examples and questions about VESPR</li> </ul>		
<b>Course Description</b>	The module includes lectures on the origin of the elements, atoms and the Periodic Table, shapes and properties of molecules, chemistry of the elements, properties of solutions, thermochemistry, thermodynamics and kinetics.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.2
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	15% (15)		
	<b>Seminars</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	15% (15)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	<b>Material Covered</b>
<b>Week 1</b>	<b>Periodic properties</b>
<b>Week 2</b>	Calculation effective nucleic charge
<b>Week 3</b>	Atomic Radius, electronegativity
<b>Week 4</b>	Electron affinity, covalent molecules
<b>Week 5</b>	<b>Bonding in Molecules &amp; Covalent Bonding</b>
<b>Week 6</b>	Hybridization of covalent molecules
<b>Week 7</b>	Theories of Covalent Bonding
<b>Week 8</b>	Midterm exam
<b>Week 9</b>	Valence Bond Theory (V.B.T)
<b>Week 10</b>	Examples and questions about VBT
<b>Week 11</b>	Examples and questions about VBT continued
<b>Week 12</b>	Molecular Orbital Theory
<b>Week 13</b>	MOT of Diatomic Molecules, homonuclear diatomic molecule, heteronuclear diatomic molecule.
<b>Week 14</b>	VESPR theory
<b>Week 15</b>	Examples and questions about VESPR
<b>Week 16</b>	<b>Final Exam</b>

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	<b>Text</b>	<b>Available in the Library?</b>
<b>Required Texts</b>	Inorganic Chemistry by Duward Shriver, Mark Weller, Tina Overton, Fraser Armstrong, Jonathan Rourke, 6 <sup>th</sup> edition, W. H. Freeman (2014).	Yes (Online)
<b>Recommended Texts</b>		
<b>Websites</b>	<a href="https://archive.org/details/inorganic-chemistry-atkins-shriver-pdf">https://archive.org/details/inorganic-chemistry-atkins-shriver-pdf</a>	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	STATISTICS الإحصاء		Module Delivery
Module Type	<b>BASIC</b>		Theory Tutorial Seminar
Module Code	<b>CHE- 1209</b>		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader		e-mail	
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	-	<b>Semester</b>	-
<b>Co-requisites module</b>	-	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. Give students a grounding in the basic concepts and techniques of applied statistics.</li> <li>2. Develop students' critical and analytical skills in discerning the correct and incorrect use of statistics in practice.</li> <li>3. Develop students' skills in solving statistical problems</li> </ol>		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p style="text-align: center;"><b>On successful completion of this module a student will be able to:</b></p> <ol style="list-style-type: none"> <li>1. Access, analyze and interpret basic statistical problems.</li> <li>2. Discern when statistics are being misused.</li> <li>3. Present results of basic statistical analyses (both descriptive and inferential).</li> <li>4. Apply simple probabilistic and statistical concepts.</li> <li>5. Construct and apply mathematical descriptions of probability distributions</li> </ol>		
<b>Indicative Contents</b> المحتويات الإرشادية	<ul style="list-style-type: none"> <li>✓ Data and surveys: Sampling; Questionnaires; Bias, error and precision.</li> <li>✓ Descriptive Statistics: Measures of location and dispersion; Diagrams and data presentation.</li> <li>✓ Statistical Inference: Significance testing and confidence intervals (sample means).</li> <li>✓ Probability: Axioms and interpretations; Addition and multiplication laws; Conditional probability.</li> <li>✓ Probability Distributions: Binomial, Poisson and Normal.</li> <li>✓ Further Inference: z-tests, t-tests, paired and unpaired tests, 2-tests.</li> <li>✓ Correlation and regression: Linear regression and significance tests on r.</li> <li>✓ Use of statistical packages in analysing data will appear as relevant in the syllabus, with an emphasis on the use of the spreadsheet software Excel.</li> </ul> <p>There will be a strong emphasis throughout the module on the understanding of the context of practical use of statistics</p>		
<b>Course Description</b>	<p>The module is intended as a first course in random variables and distributions for students studying a degree in which mathematics is to be the main subject throughout that degree as it provides a good foundation to higher level probability and statistics modules. The module assumes that a student will be competent in basic probability rules of events. Topics include: exploring features of a wide range of discrete and continuous random variables; evaluating probabilities for a specified probability distribution by calculation and by using statistical software; defining and determining generating functions for random variables, i.e. the probability generating function, the moment generating function and the cumulant generating function</p>		

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems
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## Student Workload (SWL)

### الحمل الدراسي للطالب

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	<b>63</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>4.2</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	<b>37</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>2.5</b>
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>125</b>		

## Module Evaluation

### تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	3	10% (10)		
	<b>Assignments</b>	2	10 % (10)		
	<b>Semn.</b>	2	10% (10)		
	<b>Tut.</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	probability theory , Law of probability , Bayes theory
Week 2	Random Variable, discrete random variable , continuous random variable
Week 3	define distributive theorem for random Variable
Week 4	Distribution and density function continuous random variable
Week 5	Expectation and Variance
Week 6	probability and Mathematical statistics
Week 7	Midterm exam
Week 8	Define the concepts of distribution theory,
Week 9	Define the concepts of distribution theory continued
Week 10	distribution theory
Week 11	Probability mass function
Week 12	Probability density function
Week 13	Normal distribution
Week 14	Uniform distribution
Week 15	exponential distribution
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"><li>✓ Introduction to mathematical statistics Hogg &amp; Criug</li><li>✓ Elements of mathematical statistics Racliffe</li></ul>	
Recommended Texts		No
Websites	.	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Physics الفيزياء		Module Delivery
Module Type	BASIC		Theory Lab Tutorial
Module Code	CHE- 12010		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	Semester (s) offered	2
Administering Department	Chemistry	College	Science
Module Leader	Dr. Hussein K. Mohammad	e-mail	hussienalkhalid@yahoo.com
Module Leader's Acad. Title	Lecture	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	-	<b>Semester</b>	-
<b>Co-requisites module</b>	-	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	The aim of this module is for the student to understand and gain experience of the application and delivery of a range of core and specialised methods and techniques and to understand their importance in the clinical investigation of patients		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>In order to provide the student with a complete view of the tissue organization, basic and advanced methods for analyzing the organization of human tissues and how this organization is instrumental in ensuring full homeostatic tissue function are discussed.</p> <p>The course thus aims at:</p> <ol style="list-style-type: none"> <li>1. provide basic concepts on morphology, cellular and molecular organization of human tissues;</li> <li>2. discuss in depth the cellular and molecular characteristics of the different stem cell populations in the various tissues;</li> <li>2- 3. describe the functional properties of the various tissues and cells that compose them, focusing on physiopathological aspects as well.</li> </ol>		
<b>Indicative Contents</b> المحتويات الإرشادية	<ul style="list-style-type: none"> <li>✓ Biochemistry and Cell Membrane</li> <li>✓ Cellular Activities, Transport Across Cell Membranes , Mechanism of Transfer of Materials</li> <li>✓ Active Transport, Passive Transport , Carrier Proteins , Channel Proteins</li> <li>✓ Channel Protein Transport</li> <li>✓ Functions of Water in the Body and Cell</li> <li>✓ Principles of Buffering</li> </ul>		
<b>Course Description</b>			

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems
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## Student Workload (SWL)

### الحمل الدراسي للطالب

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	<b>93</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>6.2</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	<b>57</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>3.8</b>
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

## Module Evaluation

### تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	3	10% (10)		
	<b>Assignments</b>	2	5 % (5)		
	<b>Lab</b>	6	15% (15)		
	<b>Tut.</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)		
	<b>Final Exam</b>	3	50% (50)		
<b>Total assessment</b>			<b>100% (100 Marks)</b>		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Biochemistry and Cell Membrane
Week 2	Biomolecules , Cell Membrane
Week 3	Cellular Activities, Transport Across Cell Membranes ,
Week 4	Mechanism of Transfer Across Cell Membranes
Week 5	Channel Protein Transport
Week 6	Channel Protein Transport continued
Week 7	Midterm exam
Week 8	Endoplasmic Reticulum & Golgi Apparatus
Week 9	Plasma Membrane
Week 10	Endocytosis & Exocytosis
Week 11	Functions of Water in the Body and Cell
Week 12	Principles of Buffering
Week 13	Alkaline Buffer Solutions
Week 14	Calculations Involving Buffer Solutions
Week 15	Buffer Solution in Blood
Week 16	<b>Final Exam</b>

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Principles of Biochemistry by Prof. Dr. Zena A.M. Al-Jawadi	No
Recommended Texts		No
Websites	.	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	COMPUTER PROGRAM <b>1</b>		Module Delivery
Module Type	<b>BASIC</b>		Lab. Tutorial
Module Code	CoS- 12011		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	1	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader		e-mail	
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	-	<b>Semester</b>	-
<b>Co-requisites module</b>	-	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	التعرف على أساسيات الحاسوب ومكوناته وكيفية استعماله وأهم التطبيقات الحاسوبية في الكيمياء		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>بعد الانتهاء من المقرر يتعلم الطالب</p> <ul style="list-style-type: none"> <li>- مكونات الحاسب الآلي .</li> <li>- أهم أنظمة الحاسوبية</li> <li>- أهم البرامج المستخدمة في الحاسوب</li> <li>- برنامج الورد وتطبيقاته في الكيمياء</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>			
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	<b>48</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>3.2</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	<b>27</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>1.8</b>
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>75</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	3	5% (5)		
	<b>Assignments</b>	2	5 % (5)		
	<b>Lab</b>	6	20% (20)		
	<b>Tut.</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Computer
Week 2	Structure of the computer
Week 3	Hardware Components
Week 4	Software
Week 5	Definition of Operating System & Windows Operating System
Week 6	Windows Explorer, File and Folder Operations
Week 7	Midterm exam
Week 8	Definition of Computer Virus
Week 9	Use of Antivirus software
Week 10	Types of Viruses, Effects of Viruses
Week 11	Introduction to Application Communication Tools:
Week 12	MS-Word
Week 13	MS-Word continued
Week 14	MS-PowerPoint
Week 15	MS-PowerPoint continued
Week 16	<b>Final Exam</b>

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"><li>✓ Abod, Ziad M, et al. Computer Fundamentals and Its Applications (Part 1). University House of Printing and Publishing, 2016.</li><li>✓ Abod, Ziad M, et al. Computer Fundamentals and Its Applications (Part 2). University House of Printing and Publishing, 2016</li><li>✓ al-Khazali, Wissam. Comprehensive Learning Windows 10, al-kafilu, 2020.</li></ul>	Yes
Recommended Texts		No
Websites	.	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Gravity analytical chemistry		Module Delivery
Module Type	CORE		Theory Lab. Tutorial Seminar
Module Code	CHE-23113		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Shatha Youns yahya	e-mail	<a href="mailto:dr.shatha81@tu.edu.iq">dr.shatha81@tu.edu.iq</a>
Module Leader's Acad. Title	Assist. Prof.	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	-	<b>Semester</b>	-
<b>Co-requisites module</b>	-	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	The purpose of this course is to introduce learners to the basics of Analytical Chemistry, a branch of Chemistry that deals with the analysis of real samples using various analytical techniques in order to determine the identity and quantity of substances of interest in a sample. Analytical Chemistry 1 requires some level of integrative understanding over and above minimal and descriptive understanding. Students at this level are required to apply knowledge obtained in the course to familiar contexts by sometimes explaining and analyzing data.		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	The intended subject-specific learning outcomes. 9. On successfully completing the module, students will be able to: 10. Demonstrate an understanding of key concepts in Analytical Chemistry. Solve quantitative problems relating to these concepts. 11. Suggest appropriate methods to solve analytical tasks. 12. On successfully completing the module, students will be able to: 13. Manage their time and use their organization skills within the context of self-directed learning.		
<b>Indicative Contents</b> المحتويات الإرشادية	•		
<b>Course Description</b>	The module will provide a classification of analytical chemistry, weight and concentration units, methods of expressing concentrations, aqueous-solution chemistry, chemical equilibrium, solubility, activity, and activity coefficient.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	<b>79</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>5.3</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	<b>71</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>4.7</b>
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	3	10% (10)		
	<b>Assignments</b>	2	5 % (5)		
	<b>Lab</b>	6	15% (15)		
	<b>Tut.</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	التحليل الكمي الوزني وانواعه وصفات الراسب الجيد
Week 2	النموذج ومعالجة النموذج مختبريا
Week 3	الحسابات في التحليل الكمي الوزني مع الأمثلة وحل المسائل
Week 4	الحسابات في التحليل الكمي الوزني مع الأمثلة وحل المسائل
Week 5	الحسابات في التحليل الكمي الوزني مع الأمثلة وحل المسائل
Week 6	أنواع العوامل المرسبة العضوية واللاعضوية مميزاتها وعيوبها
Week 7	Midterm exam
Week 8	أنواع العوامل المرسبة العضوية واللاعضوية مميزاتها وعيوبها
Week 9	أنواع العوامل المرسبة العضوية واللاعضوية مميزاتها وعيوبها
Week 10	ميكانيكة تكوين الراسب
Week 11	علاقة فوق الاشباع والعوامل المؤثرة عليها والحسابات
Week 12	الذوبانية وعلاقتها بالترسيب
Week 13	العوامل المؤثرة على الترسيب
Week 14	المسائل الحسابية على الذوبانية – الترسيب المتجانس
Week 15	تلوث الرواسب ومعالجتها.
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1-Fundamental of Analytical Chemistry -Skoog Douglas 2- تاليف د.صفاء رزوق المرعب - الكيمياء التحليلية – الأسس العامة للتحليل الكمي الوزني	
Recommended Texts	Analytical chemistry the fundamentals Chemical separation methods by John Dean.	
Websites		



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	INORGANIC CHEMISTRY 3		Module Delivery
Module Type	CORE		Theory practical Tutorial Seminar
Module Code	CHE-23114		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Ahmed S. Al-Janabi Dr. Adnan A. Hamada	e-mail	<a href="mailto:dr.ahmed.chem@tu.edu.iq">dr.ahmed.chem@tu.edu.iq</a>
Module Leader's Acad. Title	Professor Assist. Prof.	Module Leader's Qualification	Ph.D. Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	10/10/2024	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	None	<b>Semester</b>	-
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	The module aims to provide the students with an understanding of the fundamental principles of Inorganic Chemistry ( such as atomic structure, and the development of the atom discovery) to act as a foundation in chemistry area.		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ Students should be able to describe the fundamental principles of atomic structure and give the electronic structures of atoms and their quantum numbers.</li> <li>✓ Students should appreciate how the electronic structure of atoms leads to the build-up of the periodic table.</li> <li>✓ Students should be able to know electromagnetic radiation and black body radiation</li> <li>✓ Students should have an understanding the quantum theory.</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية	Indicative content includes the following. <ul style="list-style-type: none"> <li>✓ Fundamentals of atomic structure (6 hrs)</li> <li>✓ Historical development of atom discovery (10 hrs)</li> <li>✓ Fundamentals of electromagnetic radiation (10 hrs)</li> <li>✓ Quantum theory (12 hrs)</li> <li>✓ Case studies in inorganic chemistry (6 hrs)</li> </ul>		
<b>Course Description</b>	The module includes lectures on the origin of the elements, atoms and the Periodic Table, shapes and properties of molecules, chemistry of the elements, properties of solutions, thermochemistry, thermodynamics and kinetics.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	94	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	6.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	56	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	15% (15)		
	<b>Seminars</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	15% (15)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	S,p block elements
Week 2	Alkali elements group
Week 3	Alkali elements group continued
Week 4	Alkali elements group continued
Week 5	Earth Alkali elements group
Week 6	Earth Alkali elements group continued
Week 7	Earth Alkali elements group
Week 8	Midterm exam
Week 9	Boron group
Week 10	Boron group continued
Week 11	Carbon group
Week 12	Carbon group continued
Week 13	Nitrogen group
Week 14	Nitrogen group continued
Week 15	Nitrogen group continued
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Inorganic Chemistry by Duward Shriver, Mark Weller, Tina Overton, Fraser Armstrong, Jonathan Rourke, 6 <sup>th</sup> edition, W. H. Freeman (2014).	Yes (Online)
Recommended Texts		
Websites	<a href="https://archive.org/details/inorganic-chemistry-atkins-shriver-pdf">https://archive.org/details/inorganic-chemistry-atkins-shriver-pdf</a>	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	PHYSICAL CHEMISTRY 1		Module Delivery
Module Type	CORE		Theory Tutorial Seminar
Module Code	CHE-23115		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Faiz mohsen hamid	e-mail	<a href="mailto:Faizal.abady@tu.edu.iq">Faizal.abady@tu.edu.iq</a>
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph.D. Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	None	<b>Semester</b>	-
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	This module builds upon the entry-level knowledge of students as well as upon chemical and mathematical concepts/tools covered in other Year 1 modules. It introduces the foundations of Physical Chemistry, which studies the principles that drive properties and behaviour of chemical systems at macroscopic and microscopic levels. Specifically, it covers thermodynamics, electrochemistry, and atomic structure.		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>On completion of the module the student should be able to:</p> <ul style="list-style-type: none"> <li>✓ Develop models of chemical and physical change grounded in the fundamentals of thermodynamics</li> <li>✓ Apply the concepts, methods and techniques of thermodynamics to chemical/biochemical systems and make predictions for these systems.</li> <li>✓ Balance redox reactions. Write half-reactions in electrochemical cells.</li> <li>✓ Calculate electrochemical potential using the Nernst equation. Identify redox reactions in bio-energetic processes.</li> <li>✓ Apply quantum mechanics to describe behaviour of matter at a microscopic level</li> <li>✓ Derive term symbols arising from configurations for atoms. Apply selection rules to predict atomic spectrum and place atomic transitions in energy levels diagrams</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية	✓		
<b>Course Description</b>	The student should acquire a broad understanding of the knowledge base in Physical Chemistry and its terminology or discourse. They will operate in a range of varied but predictable contexts that require the use of a specified range of techniques and information sources. Additionally, the student will be required to identify principles and concepts underlying theoretical frameworks.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	94	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	6.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	56	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	15% (15)		
	<b>Seminars</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	15% (15)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Gases: Ideal and real gases; theoretical models
Week 2	liquefaction; critical region
Week 3	Liquids: viscosity
Week 4	surface tension; refractive index
Week 5	Laws of thermodynamics
Week 6	thermodynamic parameters
Week 7	thermodynamic parameters
Week 8	Midterm exam
Week 9	chemical equilibria and reaction quotient
Week 10	chemical equilibria and reaction quotient
Week 11	Phase diagrams
Week 12	miscible and immiscible systems
Week 13	Reaction Rate Determination Methods
Week 14	Reaction Rate Determination Methods
Week 15	Reaction Rate Determination Methods
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Peter Atkins, Julio de Paula, James Keeler 2018, <i>Physical chemistry</i> , 11th Ed., OUP [ISBN: 9780198769866]	Yes (Online)
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	ORGANIC CHEMISTRY 1		Module Delivery	
Module Type	CORE		Theory Tutorial Seminar	
Module Code	CHE-23116			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	2	Semester (s) offered		3
Administering Department	Chemistry	College	Science	
Module Leader	Dr. Thaaer Fadhil Khalil		e-mail	<a href="mailto:thaaer.f.khalil@tu.edu.iq">thaaer.f.khalil@tu.edu.iq</a>
Module Leader's Acad. Title	Lecture	Module Leader's Qualification	Ph.D.	
Module Tutor	None		e-mail	None
Peer Reviewer Name		e-mail		
Review Committee Approval	05/06/2023	Version Number	1.0	

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	None	<b>Semester</b>	-
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	To further students' understanding of basic concepts in organic chemistry in order to better appreciate related subjects such as Biochemistry, Biomedical Sciences and Medicinal Chemistry		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ Name simple organic compounds and write molecular formulae from given names.</li> <li>✓ Draw diagrams of molecules indicating the hybridisation state of individual atoms, showing the disposition of molecular orbitals.</li> <li>✓ Assign the stereochemistry of simple organic compounds; explain the mechanisms of substitution and elimination reactions.</li> <li>✓ Describe and explain the reactivity of alkenes and alkynes toward a selection of reagents.</li> <li>✓ Describe and explain the concept of aromaticity.</li> <li>✓ Explain the mechanisms of nucleophilic attack upon a variety of carbonyl containing groups.</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية	✓		
<b>Course Description</b>	To introduce students to the basic concepts of organic chemistry (to encompass the structure of organic compounds, isomerism, the concept of a functional group and the unifying concepts of mechanism) in order to provide the foundation for treatment at a greater depth in later modules or to better appreciate related subjects such as Biochemistry and Medicinal Chemistry.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	15% (15)		
	<b>Seminars</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	15% (15)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Atomic structure, orbitals and hybridisation state, electron accounting
Week 2	Alkanes
Week 3	Preparation and reactions of Alkanes
Week 4	Alkenes
Week 5	Preparation and reactions of Alkenes
Week 6	Alkynes
Week 7	Preparation and reactions of Alkynes
Week 8	Midterm exam
Week 9	Aromatic molecules, nomenclature, the discussion of molecular shape, isomerism
Week 10	Aromatic molecules, nomenclature, the discussion of molecular shape, isomerism
Week 11	SN1 and SN2 processes
Week 12	SN1 and SN2 processes
Week 13	electrophiles and nucleophiles in substitution reactions
Week 14	electrophiles and nucleophiles in substitution reactions
Week 15	elimination reactions
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Text book in organic chemiistry	Yes (Online)
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	MATHEMATICS II		Module Delivery
Module Type	BASIC		Theory Tutorial Seminar
Module Code	CoS- 23118		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	2	Semester (s) offered	3
Administering Department	Chemistry	College	Science
Module Leader		e-mail	
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	-	<b>Semester</b>	-
<b>Co-requisites module</b>	-	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	Mathematics is fundamental to the study of chemistry. This course aims to introduce the concepts of calculus, complex numbers, vectors, linear algebra and statistics		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ knowledge of key ideas related to mathematics in the chemistry department</li> <li>✓ knowledge of the National Curriculum for mathematics and the way in which it facilitates the development of mathematical understanding</li> <li>✓ an understanding of the way in which theory informs practice and vice versa</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	This course introduces fundamental computing principles and programming concepts. Students use the high-level programming language,		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	<b>48</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>3.2</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	<b>27</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>1.8</b>
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>75</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	3	10% (10)		
	<b>Assignments</b>	2	10 % (10)		
	<b>Semn.</b>	2	10% (10)		
	<b>Tut.</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	functions, graph of function, continuous function
Week 2	odd and even functions, Invers of functions
Week 3	Limits, find the limits for real functions .
Week 4	Derivative , Derivative for Transcendental functions, chain rule, partial derivative , Exponential Functions, Logarithmic functions and chemical application of these functions
Week 5	Trigonometric functions
Week 6	Derivative of trigonometric functions
Week 7	Midterm exam
Week 8	The invers of trigonometric function, derivative of trigonometric functions
Week 9	Hyperbolic function , properties of hyperbolic functions, derivative of hyperbolic function
Week 10	Method of Integration
Week 11	Application of integration .
Week 12	Gamma And Beta function, Transitive number .
Week 13	series, Convergent Series, Ratio and Root test .
Week 14	Series of Taylor and Maclaurin
Week 15	Lopital Rotes for finding limits
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	✓ SCHAUM'S advanced calculus ✓ حسابان التفاضل والتكامل / تأليف د. صبري العاني	
Recommended Texts		No
Websites	.	



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## MODULE DESCRIPTOR

### وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	COMPUTER PROGRAM II		Module Delivery
Module Type	<b>BASIC</b>		Lab. Tutorial
Module Code	CoS- 23117		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	2	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader		e-mail	
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	-	<b>Semester</b>	-
<b>Co-requisites module</b>	-	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	التعرف على أساسيات الحاسوب ومكوناته وكيفية استعماله وأهم التطبيقات الحاسوبية في الكيمياء		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>بعد الانتهاء من المقرر يتعلم الطالب</p> <ul style="list-style-type: none"> <li>- مكونات الحاسب الآلي .</li> <li>- أهم أنظمة الحاسوبية</li> <li>- أهم البرامج المستخدمة في الحاسوب</li> <li>- برنامج الورد وتطبيقاته في الكيمياء</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>			
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and, where possible practical) examples. Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	<b>48</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	<b>3.2</b>
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	<b>27</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	<b>1.8</b>
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>75</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	3	5% (5)		
	<b>Assignments</b>	2	5 % (5)		
	<b>Lab</b>	6	20% (20)		
	<b>Tut.</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	2	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Computer
Week 2	Structure of the computer
Week 3	Hardware Components
Week 4	Software
Week 5	Definition of Operating System & Windows Operating System
Week 6	Windows Explorer, File and Folder Operations
Week 7	Midterm exam
Week 8	Definition of Computer Virus
Week 9	Use of Antivirus software
Week 10	Types of Viruses, Effects of Viruses
Week 11	Introduction to Application Communication Tools:
Week 12	MS-Word
Week 13	MS-Word continued
Week 14	MS-PowerPoint
Week 15	MS-PowerPoint continued
Week 16	<b>Final Exam</b>

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"> <li>✓ Abod, Ziad M, et al. Computer Fundamentals and Its Applications (Part 1). University House of Printing and Publishing, 2016.</li> <li>✓ Abod, Ziad M, et al. Computer Fundamentals and Its Applications (Part 2). University House of Printing and Publishing, 2016</li> <li>✓ al-Khazali, Wissam. Comprehensive Learning Windows 10, al-kafilu, 2020.</li> </ul>	Yes
Recommended Texts		No
Websites	.	



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## MODULE DESCRIPTOR

Module Information			
معلومات المادة الدراسية			
Module Title	COORDINATION CHEMISTRY 1		Module Delivery
Module Type	CORE		Theory Tutorial Seminar
Module Code	CHE-35125		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Ahmed S. M. Al-Janabi Dr. Nora Amin Salah	e-mail	dr.ahmed.chem@tu.edu.iq
Module Leader's Acad. Title	Prof. Dr. Lecture	Module Leader's Qualification	Ph. D. Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	10/10/2024	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	CHE-24120	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	To introduce students to the IUPAC nomenclature-bonding theories. Review of Werner's theory and Sidgwick's concept of coordination. Valence bond theory – geometries of coordination numbers 4-tetrahedral and square planar and 6-Octahedral and its limitations, crystal field theory- splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes – low spin and high spin complexes- factors affecting crystal-field splitting energy, merits and demerits of crystal-field theory. Isomerism in coordination compounds – structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	To understand the key features of coordination compounds, including: 1- The variety of structures 2- Oxidation numbers and IUPAC nomenclature. 3- Coordination number 4- Ligands, chelates. 5- Isomerism 6- VB theory, CFT theory, MO theory.		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	This course introduces knowledge essential to the understanding of coordination chemistry. Following this, Theories related to metal complexes including VB, CFT, MO theories. These topics lead to a description of molecular structures including 4 and 6 coordination number complexes.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.2
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	15% (15)		
	<b>Seminars</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	15% (15)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Werner's theory and Sidgwick's concept of coordination
Week 2	Important terms involving coordination compounds
Week 3	The IUPAC nomenclature of coordination compounds
Week 4	Types of ligands
Week 5	Isomerism in coordination compounds
Week 6	Valence Bond theory
Week 7	Limitations of VB theory
Week 8	Midterm exam
Week 9	crystal field theory
Week 10	splitting of d-orbitals in tetrahedral and octahedral complexes
Week 11	low spin and high spin complexes
Week 12	Jahn teller distortion
Week 13	Hybridization
Week 14	Molecular Orbital theory –Homo-diatomic and Hetero-diatomic molecules
Week 15	Sigma and Pi bonding in Molecular orbital theory
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Textbook of inorganic chemistry	Yes
Recommended Texts	Principle of Inorganic chemistry by Cotton and Wilkinson Basic Principles of Inorganic Chemistry making the Connections by Murphy Inorganic Chemistry some new facts by R.C. Maurya	
Websites		



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## MODULE DESCRIPTOR

<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>KINETIC CHEMISTRY</b>		<b>Module Delivery</b>
<b>Module Type</b>	CORE		Theory lab. Tutorial Seminar
<b>Module Code</b>	CHE-35126		
<b>ECTS Credits</b>	6		
<b>SWL (hr/sem)</b>	150		
<b>Module Level</b>	3	<b>Semester (s) offered</b>	
<b>Administering Department</b>	Chemistry	<b>College</b>	Science
<b>Module Leader</b>	Dr. Layla A. Jaber	<b>e-mail</b>	<a href="mailto:Layla.a.jaber@tu.edu.iq">Layla.a.jaber@tu.edu.iq</a>
<b>Module Leader's Acad. Title</b>	Professor	<b>Module Leader's Qualification</b>	Ph. D. Ph.D.
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>		<b>e-mail</b>	
<b>Review Committee Approval</b>	05/06/2023	<b>Version Number</b>	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CHE-24121	Semester	5
Co-requisites module	None	Semester	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description			
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	يهدف المقرر الى تعريف الطلبة ما هي الكيمياء الفيزيائية الحركية والكهربائية وكيف يمكن ان يتبع الطالب التفاعلات وما يحدث خلال التفاعل في فترات زمنية مختلفة وعند درجة حرارة ثابتة ومختلفة		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ • provide an introduction to chemical kinetic</li> <li>✓ • show how the rates of reaction depend upon concentration, temperature and time and other variables</li> <li>✓ • to explore the relationship between reaction rate law and the mechanism of reaction</li> <li>✓ • to examine complex reactions such as enzyme reaction, chain and branched chain reaction.</li> </ul>		
Indicative Contents المحتويات الإرشادية			
Course Description	يصف الكورس الى تعريف الطلبة ما هي الكيمياء الفيزيائية الحركية والكهربائية وكيف يمكن ان يتبع الطالب التفاعلات وما يحدث خلال التفاعل في فترات زمنية مختلفة وعند درجة حرارة ثابتة ومختلفة كما يصف الكورس الى تعريف الطالب ماهو الكم وفوائده للطالب الكيميائي واهمية الدراسة النظرية والحسابية للكيميائي ووصف البرنامج التعليمي بشكل حسابي وكما يصف تعريف الطيف الجزيئي وكيفية معرفة مناطق الطيف المغناطيسي وإيجاد المجهول منها وتشخيص المركب الكيميائي لكل منطقة من من مناطق الطيف بطريقة حسابية .		
Learning and Teaching Strategies			
استراتيجيات التعلم والتعليم			
Strategies	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	مقدمة شاملة عن المقرر تعاريف - سرعة التفاعلات الكيميائية - طرق قياسها - العوامل المؤثرة فيها.
Week 2	درجة التفاعل الكيميائي - الجزيئية ودرجة التفاعل - ثابت التفاعل النوعي - أنواع التفاعلات .
Week 3	تفاعلات الدرجة الأولى (أمثلة ) حل مسائل على الدرجة الأولى تفاعلات الدرجة الأولى في الحالة الغازية .
Week 4	تفاعلات الدرجة الثانية عند تساوي التركيز - تفاعلات الدرجة الثانية عند اختلاف التركيز (أمثلة ) .
Week 5	تفاعلات الدرجة الثالثة والحالة العامة (أمثلة)
Week 6	طرق إيجاد درجة التفاعل وثابت التفاعل النوعي
Week 7	التفاعلات المعقدة - التفاعلات العكسية_ التفاعلات العكسية ذات الدرجات العالية
Week 8	Midterm exam
Week 9	التفاعلات المتتابعة
Week 10	التفاعلات المتوازية (اشتقاق + أمثلة )
Week 11	التفاعلات التسلسلية(اشتقاق).
Week 12	علاقة الطاقة الحرة وانتروبي التنشيط بثابت سرعة التفاعلات
Week 13	التفاعلات في المحاليل .
Week 14	طاقة الحركة للتفاعلات الكيميائية ( الطاقة الحرة للتفاعل - تنشيط التفاعل
Week 15	المحفز - شروطه - انواعه - التحفيز الانزيمي
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	<ol style="list-style-type: none"> <li>1. الكيمياء الحركية" رضا محمد سعيد عبيد, كلية العلوم -جامعة الملك سعود (الطبعة الأولى 1974م)</li> <li>2. " الحركية الكيميائية وميكانيكيات التفاعلات" سليمان الخويطر ( 1998 م ).</li> <li>3. "مجموعة مسائل في الكيمياء الفيزيائية " بارز سيرني و فريد بيك ، ترجمة : ليلي محمد نجيب سليم و السيد خالد الغنام - وزارة التعليم العالي ،جامعة الموصل (1985م)</li> </ol>	Yes (Online)
Recommended Texts		
Websites		



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Department of Chemistry



## MODULE DESCRIPTOR

<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>ORGANIC CHEMISTRY 3</b>		<b>Module Delivery</b>
<b>Module Type</b>	CORE		<b>Theory lab. Tutorial Seminar</b>
<b>Module Code</b>	CHE-35127		
<b>ECTS Credits</b>	6		
<b>SWL (hr/sem)</b>	150		
<b>Module Level</b>	3	<b>Semester (s) offered</b>	
<b>Administering Department</b>	Chemistry	<b>College</b>	Science
<b>Module Leader</b>	Dr. Fadel Daoud Khaled	<b>e-mail</b>	<a href="mailto:F-D.khalled@tu.edu.iq">F-D.khalled@tu.edu.iq</a>
<b>Module Leader's Acad. Title</b>	Assist. Prof.	<b>Module Leader's Qualification</b>	Ph. D.
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>		<b>e-mail</b>	
<b>Review Committee Approval</b>	05/06/2023	<b>Version Number</b>	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	CHE-24122	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	This module will broaden your appreciation of organic chemistry to consider the reactions of compounds containing second row elements (silicon, phosphorus and sulphur). You will be introduced to photochemistry and the chemistry of the excited state. This will lead to an understanding of the basis of radical chemistry and reactive intermediates. The second half of the module will focus on the mechanistic interpretation of apparently complex processes.		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ Categorise the use of second row elements in synthesis.</li> <li>✓ Evaluate the use of organometallic reagents in organic synthesis.</li> <li>✓ Evaluate the role of reactive intermediates in complex mechanisms.</li> <li>✓ Apply orbital symmetry considerations and advanced transition state theory in rationalising the outcome of complex mechanisms.</li> <li>✓ Analyse reactions in terms of linear free energy relationships.</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	A vital aim of organic chemistry is to be able to synthesise biologically active molecules. With this in mind, you will explore some of the most important organic reactions used in research laboratories. These reactions, along with those introduced in earlier modules, are then studied in the laboratory. Having been introduced to modern spectroscopic methods for determining the structures of organic molecules, these techniques are then used to identify the compounds which have been prepared in the laboratory. Aromatic compounds are central to the structure of a vast number of important organic molecules and the chemistry of these species will also be studied.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Carbonyl compounds
Week 2	Aldehyde and ketones chemistry
Week 3	Reaction of Aldehyde and ketones
Week 4	Preparation of Aldehyde and ketones
Week 5	Carboxylic acid compounds
Week 6	Reaction of carboxylic acid s
Week 7	Preparation of carboxylic acids
Week 8	Midterm exam
Week 9	Reaction of Carboxylic acid derivatives
Week 10	Carboxylic acid derivatives
Week 11	Preparation of Carboxylic acid derivatives
Week 12	Stereochemistry
Week 13	Stereochemistry continued
Week 14	Stereochemistry continued
Week 15	Stereochemistry continued
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Textbook of Organic chemistry	
Recommended Texts		
Websites		



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College of Science  
Department of Chemistry



## MODULE DESCRIPTOR

Module Information			
معلومات المادة الدراسية			
Module Title	BIOCHEMISTRY 1		Module Delivery
Module Type	CORE		Theory lab. Tutorial Seminar
Module Code	CHE-35128		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Sheerin Farouq Shaker	e-mail	<a href="mailto:sheerinfaroksh@tu.edu.iq">sheerinfaroksh@tu.edu.iq</a>
Module Leader's Acad. Title	Lecture	Module Leader's Qualification	Ph. D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	None	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	This module aims to teach you core concepts in biochemistry including topics on structure of proteins, enzyme kinetics and metabolic pathways. The module will also provide a background to fundamental aspects of chemistry. This module provides you with the core knowledge and skills to enhance performance in the area of biological chemistry		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Describe the important milestones in the history of biochemistry</li> <li>2. Identify the different branches of biochemistry</li> <li>3. Enumerate the properties of a living organism</li> <li>4. Identify the trace and bulk elements essential to humans and other living organisms</li> </ol>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	The study of biochemistry shows how organic compounds present in living organisms interact to maintain and perpetuate life. In this brief introduction, we will describe the milestones in the history of biochemistry, the different branches of the field, the attributes of living organisms, and the various elements that comprise living organisms		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	The cell
Week 2	Fundamental of biochemistry
Week 3	Carbohydrate
Week 4	Carbohydrate continued
Week 5	Carbohydrate continued
Week 6	Carbohydrate continued
Week 7	Carbohydrate continued
Week 8	Lipids
Week 9	Midterm exam
Week 10	Lipids continued
Week 11	Lipids continued
Week 12	Lipids continued
Week 13	Nucleic acids
Week 14	Nucleic acids continued
Week 15	Nucleic acids continued
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Berg JM, Tymoczko JL, Stryer L (2012) <i>Biochemistry</i> , 7th Ed., Freeman ISBN 13: 978-1-4292-7635-1	
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

Module Information			
معلومات المادة الدراسية			
Module Title	INDUSTRIAL CHEMISTRY 1		Module Delivery
Module Type	CORE		Theory lab. Tutorial Seminar
Module Code	CHE-35129		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Ali O. Muhammed Dr. Raghad Mohammed Omer		e-mail <a href="mailto:ali.omairi.1969@tu.edu.iq">ali.omairi.1969@tu.edu.iq</a> <a href="mailto:Raghad.m.omar@tu.edu.iq">Raghad.m.omar@tu.edu.iq</a>
Module Leader's Acad. Title	Assist. Prof. Lecture	Module Leader's Qualification	Ph. D. Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	None	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	<ul style="list-style-type: none"> <li>✓ Introduce students to aspects of industrial chemical manufacture and processing</li> <li>✓ To give an overview of the manufacture of important inorganic, polymer materials and pharmaceuticals</li> <li>✓ Give an overview of the petrochemical industry</li> <li>✓ Introduce students to aspects of industrial planning, safety and associated social issues</li> </ul>		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p><i>On successful completion of this module the learner will be able to:</i></p> <ul style="list-style-type: none"> <li>✓ Describe the chemical industry and identify the distinguishing features of its component parts</li> <li>✓ Explain the importance and roles of route selection, process economics and process optimisation in chemical processing</li> <li>✓ Describe the industrial production of a number of important organic and inorganic chemicals</li> <li>✓ Evaluate environmental issues pertaining to the chemical industry</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	المفاعلات الصناعية وانواعها
Week 2	العوامل المساعدة المستخدمة في المفاعلات الكيميائية
Week 3	الغاز الطبيعي، تصنيع الاثيلين
Week 4	الايثانول، تصنيع الاثيلين او كسايد تصنيع
Week 5	تصنيع الاثيلين كلايكول
Week 6	تصنيع الميثانول
Week 7	تصنيع الاسمنت
Week 8	Midterm exam
Week 9	تصنيع الزيوت والشموع
Week 10	تصنيع الصابون
Week 11	تصنيع المنظفات
Week 12	تصنيع الورق وانواعه
Week 13	تصنيع الزجاج وانواعه
Week 14	انتاج الامونيا
Week 15	تصنيع الاسمدة
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	صناعات الكيميائية الصغيرة   محمد احمد السيد خليل الصناعات الكيميائية   د. احمد مدحت اسلام الكيمياء الصناعية   ام نعمان كاظم خضير	Yes
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

Module Information			
معلومات المادة الدراسية			
Module Title	COORDINATION CHEMISTRY 2		Module Delivery
Module Type	CORE		Theory Tutorial Seminar
Module Code	CHE-36131		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Ahmed Sabah Faihan Dr. Nora Amin Salah	e-mail	a-s.fehan@tu.edu.iq
Module Leader's Acad. Title	Lecture Lecture	Module Leader's Qualification	Ph. D. Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	CHE-35125	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	To introduce students to the Metal ligand equilibria in solution. The stepwise and overall formation constants and their interactions. Factors affecting stability of metal complexes with reference to the Nature of metal ion and ligand. Chelate effect and its thermodynamic origin. Inert and labile complexes. Mechanisms for ligand replacement reactions. Mechanism of ligand Displacement reactions in square planar complexes. The trans effect. Finally, Magnetic properties of Transition metal complexes.		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	To understand the stability of the metal complexes, including: <ul style="list-style-type: none"> <li>1- Metal ligand equilibria</li> <li>2- Factors affecting the complex stability.</li> <li>3- Types of reaction mechanism in metal complexes reactions</li> <li>4- Magnetic properties of metal complexes.</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	This course introduces knowledge essential to the understanding of Stability of transition metal complexes. Following this, Factors affection the stability of metal complexes. Also, the introductory of Reaction mechanism and magnetic properties of metal complexes.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.2
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	15% (15)		
	<b>Seminars</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	15% (15)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Stepwise and overall formation constants and their interactions
Week 2	Factor affecting stability of metal complexes
Week 3	Chelate effect and its thermodynamic origin
Week 4	Inert and labile complexes
Week 5	Ligand Displacement reactions in Octahedral complexes, acid hydrolysis, base hydrolysis
Week 6	Electrophilic attack on ligands.
Week 7	Mechanism of ligand displacement reactions in square planar complexes, the trans effect
Week 8	Midterm exam
Week 9	Elementary theory of magneto-chemistry
Week 10	Gyoy's method for determination of Magnetic susceptibility
Week 11	Calculation of Magnetic Moments
Week 12	Magnetic properties of free ions
Week 13	Orbital contribution: effect of ligand-field
Week 14	Application of Magneto-chemistry in structure determination
Week 15	Magnetic exchange coupling and spin state cross over
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Textbook of inorganic chemistry	
Recommended Texts	Principle of Inorganic chemistry by Cotton and Wilkinson Basic Principles of Inorganic Chemistry making the Connections by Murphy Inorganic Chemistry some new facts by R.C. Maurya	
Websites		



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Department of Chemistry



## MODULE DESCRIPTOR

Module Information			
معلومات المادة الدراسية			
Module Title	ELECTROCHEMISTRY		Module Delivery
Module Type	CORE		Theory lab. Tutorial Seminar
Module Code	CHE-35126		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Layla A. Jaber	e-mail	<a href="mailto:Layla.a.jaber@tu.edu.iq">Layla.a.jaber@tu.edu.iq</a>
Module Leader's Acad. Title	Professor	Module Leader's Qualification	Ph. D. Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	CHE-24121	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	This module will build on the material covered by the Physical Chemistry 1 module. By the end of this module, students should have a deeper understanding of thermodynamics, including statistical thermodynamics. This module will also introduce students to electrochemistry, quantum mechanics, colloids and physical chemistry at surfaces and interfaces		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ Interpret the behaviour of both mono- &amp; multicomponent systems and rationalise the inter- and intramolecular forces that give rise to their phase behaviour.</li> <li>✓ Explain how ions interact with one another in solution and how the freedom of movement of the ions impacts on the degree of charge flow and its relation to current.</li> <li>✓ Rationalise why ions may be tabulated according to their standard reduction potential values and the utility of such a table in determining standard cell potentials.</li> <li>✓ Discuss the development of, and ideas contained within, quantum theory and demonstrate the utility in comparing physical and observable quantum effects with the fundamental assumptions of this theory.</li> <li>✓ Understand the significance of the Boltzmann distribution, and its role in determining partition functions.</li> <li>✓ Rationalise the application of statistical mechanics to quantifying a number of thermodynamic properties</li> <li>✓</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	This module will build on the material covered by the Physical Chemistry 1 module. By the end of this module, students should have a deeper understanding of thermodynamics, including statistical thermodynamics. This module will also introduce students to electrochemistry, quantum mechanics, colloids and physical chemistry at surfaces and interfaces		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fundamental Mathematical Concepts
Week 2	Introduction of electrochemistry terms and concepts
Week 3	ionic strength and activity
Week 4	conductivity, molar conductivity
Week 5	limiting molar conductivity
Week 6	electrochemical cells and half cells
Week 7	standard reduction potentials and their use to determine spontaneity
Week 8	Standard cell potentials
Week 9	<b>Midterm exam</b>
Week 10	Electrolysis
Week 11	Electrolysis
Week 12	thermodynamics and equilibrium
Week 13	thermodynamics and equilibrium continued
Week 14	Nernst equation
Week 15	Nernst equation continued
Week 16	<b>Final Exam</b>

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	A J Bard and L R Faulkner (2001). Electrochemical Methods. Chichester: Ellis Horwood Ltd	Yes (Online)
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

Module Information			
معلومات المادة الدراسية			
Module Title	ORGANIC CHEMISTRY 3		Module Delivery
Module Type	CORE		Theory lab. Tutorial Seminar
Module Code	CHE-36133		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Fadel Daoud Khaled	e-mail	<a href="mailto:F-D.khalled@tu.edu.iq">F-D.khalled@tu.edu.iq</a>
Module Leader's Acad. Title	Assist. Prof.	Module Leader's Qualification	Ph. D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	CHE-24122	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	This module will broaden your appreciation of organic chemistry to consider the reactions of compounds containing second row elements (silicon, phosphorus and sulphur). You will be introduced to photochemistry and the chemistry of the excited state. This will lead to an understanding of the basis of radical chemistry and reactive intermediates. The second half of the module will focus on the mechanistic interpretation of apparently complex processes.		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ Categorise the use of second row elements in synthesis.</li> <li>✓ Evaluate the use of organometallic reagents in organic synthesis.</li> <li>✓ Evaluate the role of reactive intermediates in complex mechanisms.</li> <li>✓ Apply orbital symmetry considerations and advanced transition state theory in rationalising the outcome of complex mechanisms.</li> <li>✓ Analyse reactions in terms of linear free energy relationships.</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	A vital aim of organic chemistry is to be able to synthesize biologically active molecules. With this in mind, you will explore some of the most important organic reactions used in research laboratories. These reactions, along with those introduced in earlier modules, are then studied in the laboratory. Having been introduced to modern spectroscopic methods for determining the structures of organic molecules, these techniques are then used to identify the compounds which have been prepared in the laboratory. Aromatic compounds are central to the structure of a vast number of important organic molecules and the chemistry of these species will also be studied.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Chemistry of amines
Week 2	Preparation of amine compounds
Week 3	Reactions of amines
Week 4	Chemistry of phenols
Week 5	Preparation of phenols compounds
Week 6	Reactions of phenols
Week 7	Midterm exam
Week 8	alpha, beta – unsaturated ketones
Week 9	alpha, beta – unsaturated ketones
Week 10	alpha, beta – unsaturated ketones
Week 11	Aryl halides
Week 12	Aryl halides
Week 13	poly nuclear aromatic system
Week 14	Heterocyclic compounds
Week 15	Heterocyclic compounds
Week 16	Final Exam

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Textbook of Organic chemistry	
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

Module Information			
معلومات المادة الدراسية			
Module Title	BIOCHEMISTRY 2		Module Delivery
Module Type	CORE		Theory lab. Tutorial Seminar
Module Code	CHE-35128		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Sheerin Farouq Shaker	e-mail	<a href="mailto:sheerinfaroksh@tu.edu.iq">sheerinfaroksh@tu.edu.iq</a>
Module Leader's Acad. Title	Lecture	Module Leader's Qualification	Ph. D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	None	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	This module aims to teach you core concepts in biochemistry including topics on structure of proteins, enzyme kinetics and metabolic pathways. The module will also provide a background to fundamental aspects of chemistry. This module provides you with the core knowledge and skills to enhance performance in the area of biological chemistry		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>5. Describe the important milestones in the history of biochemistry</li> <li>6. Identify the different branches of biochemistry</li> <li>7. Enumerate the properties of a living organism</li> <li>8. Identify the trace and bulk elements essential to humans and other living organisms</li> </ol>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	The study of biochemistry shows how organic compounds present in living organisms interact to maintain and perpetuate life. In this brief introduction, we will describe the milestones in the history of biochemistry, the different branches of the field, the attributes of living organisms, and the various elements that comprise living organisms		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Amino acids chemistry
Week 2	Amino acids chemistry continued
Week 3	Peptide chemistry
Week 4	Protein chemistry
Week 5	Protein chemistry continued
Week 6	Protein chemistry continued
Week 7	Protein chemistry
Week 8	<b>Midterm exam</b>
Week 9	Enzymes
Week 10	Enzymes continued
Week 11	Vitamin
Week 12	Vitamin continued
Week 13	Hormones
Week 14	Mechanism of Hormones action
Week 15	Free energy is the useful energy in a system
Week 16	<b>Final Exam</b>

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Berg JM, Tymoczko JL, Stryer L (2012) <i>Biochemistry</i> , 7th Ed., Freeman ISBN 13: 978-1-4292-7635-1	
<b>Recommended Texts</b>		
<b>Websites</b>		



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## MODULE DESCRIPTOR

<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>INDUSTRIAL CHEMISTRY 2</b>		<b>Module Delivery</b>
<b>Module Type</b>	CORE		Theory lab. Tutorial Seminar
<b>Module Code</b>	CHE-37134		
<b>ECTS Credits</b>	4		
<b>SWL (hr/sem)</b>	100		
<b>Module Level</b>	3	<b>Semester (s) offered</b>	
<b>Administering Department</b>	Chemistry	<b>College</b>	Science
<b>Module Leader</b>	Dr. Ali O. Muhammed Dr. Raghad Mohammed Omer	<b>e-mail</b>	<a href="mailto:ali.omairi.1969@tu.edu.iq">ali.omairi.1969@tu.edu.iq</a> <a href="mailto:Raghad.m.omar@tu.edu.iq">Raghad.m.omar@tu.edu.iq</a>
<b>Module Leader's Acad. Title</b>	Assist. Prof. Lecture	<b>Module Leader's Qualification</b>	Ph. D. Ph.D.
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>		<b>e-mail</b>	
<b>Review Committee Approval</b>	05/06/2023	<b>Version Number</b>	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	35029	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	<ul style="list-style-type: none"> <li>✓ Introduce students to aspects of industrial chemical manufacture and processing</li> <li>✓ To give an overview of the manufacture of important inorganic, polymer materials and pharmaceuticals</li> <li>✓ Give an overview of the petrochemical industry</li> <li>✓ Introduce students to aspects of industrial planning, safety and associated social issues</li> </ul>		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p><i>On successful completion of this module the learner will be able to:</i></p> <ul style="list-style-type: none"> <li>✓ Describe the chemical industry and identify the distinguishing features of its component parts</li> <li>✓ Explain the importance and roles of route selection, process economics and process optimisation in chemical processing</li> <li>✓ Describe the industrial production of a number of important organic and inorganic chemicals</li> <li>✓ Evaluate environmental issues pertaining to the chemical industry</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	المفاعلات الصناعية وانواعها
Week 2	العوامل المساعدة المستخدمة في المفاعلات الكيميائية
Week 3	الغاز الطبيعي، تصنيع الاثيلين
Week 4	الايثانول , تصنيع الاثيلين او كسايد تصنيع
Week 5	تصنيع الاثيلين كلايكول
Week 6	تصنيع الميثانول
Week 7	تصنيع الاسمنت
Week 8	Midterm exam
Week 9	تصنيع الزيوت والشموع
Week 10	تصنيع الصابون
Week 11	تصنيع المنظفات
Week 12	تصنيع الورق وانواعه
Week 13	تصنيع الزجاج وانواعه
Week 14	انتاج الامونيا
Week 15	تصنيع الاسمدة
Week 16	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	صناعات الكيمياء الصغيرة   محمد احمد السيد خليل الصناعات الكيمياءية   د. احمد مدحت اسلام الكيمياء الصناعية   ام نعمان كاظم خضير	Yes
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

Module Information			
معلومات المادة الدراسية			
Module Title	Instrumental analysis 1		Module Delivery
Module Type	CORE		Theory Tutorial Seminar
Module Code	CHE- 47137		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	4	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Sarhan Ali Salman	e-mail	<a href="mailto:sarhan.ali@tu.edu.iq">sarhan.ali@tu.edu.iq</a>
Module Leader's Acad. Title	Assist. Prof	Module Leader's Qualification	Ph. D. Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CHE-24120	Semester	5
Co-requisites module	None	Semester	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	To effectively problem-solve and critically evaluate analytical techniques such as Chromatography, Electroanalysis, Microscopy and Spectroscopy		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<p>On completion of this module, students are expected to be able to:</p> <ol style="list-style-type: none"> <li>1 Critically evaluate and appraise a range of advanced analytical instrumentation.</li> <li>2 Critically appraise and discuss conventional techniques for the solution of a given analytical problem.</li> <li>3 Demonstrate critical professional competence in oral presentations and data handling skills for the solution of a given analytical problem.</li> </ol>		
Indicative Contents المحتويات الإرشادية			
Course Description	<p>This module presents a review of standardisation and use of commoner reagents in acid/base, redox, precipitation and complexation reactions It will also offer an Introduction to gravimetry, principles, instrumentation and applications of UV/VIS, IR and atomic absorption spectrometry as well as a comparative overview of methods.</p> <p>In addition, the module will include coverage of the following: application of Beer's Law to calibration and to mixtures, brief introduction to principles of chromatography and sorption processes - partition, ion exchange etc, columns, detector types, mobile and stationary phases, outline of high performance liquid chromatography, qualitative and quantitative analysis</p> <p>Also, this module provides an introduction to some of the concepts related to (i) mass balance calculations -applications to straightforward batch processes and steady state flow systems with and without chemical reactions, examples from chemical processing and from the environment-, (ii) statistics and chemical measurement -precision, accuracy and errors, mean, standard deviation and confidence limits, propagation of errors, error in linear calibration-, and (iii) instrument computer interfacing and on-line use of microchips in the measurement, collection and evaluation of chemical data.</p>		
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	15% (15)		
	<b>Seminars</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	15% (15)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	UV and visible spectrophotometry ,principle ,instrumentation and application.
Week 2	UV and visible spectrophotometry ,principle ,instrumentation and application.
Week 3	UV and visible spectrophotometry ,principle ,instrumentation and application.
Week 4	IR spectrophotometry ,principle ,instrumentation and application.
Week 5	IR spectrophotometry ,principle ,instrumentation and application.
Week 6	IR spectrophotometry ,principle ,instrumentation and application.
Week 7	Phosphorescence
Week 8	Midterm exam
Week 9	chemiluminescence
Week 10	Turbidimetry and Nephelometry
Week 11	Flow injection
Week 12	Flam atomic emission .flame atomic, absorption non flame, atomic absorption
Week 13	plasma atomic
Week 14	X-ray emission ,X-ray fluorescence,
Week 15	Derivative spectrometry and laser spectrometry
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Analytical Chemistry 8e by Douglas A. Skoog	
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

Module Information			
معلومات المادة الدراسية			
Module Title	ORGANIC IDENTIFICATION 1		Module Delivery
Module Type	CORE		Theory lab. Tutorial Seminar
Module Code	CHE-47138		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	4	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Ibtihal Q. Dr. Ayad Sadi Hameed	e-mail	
Module Leader's Acad. Title	Professor Professor	Module Leader's Qualification	Ph. D. Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CHE-24121	Semester	5
Co-requisites module	None	Semester	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description			
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	تعليم الطالب التفاعلات الكيميائية العضوية والتراكيب الكيميائية ومعرفة البنية للمركبات العضوية وكيفية توضيح ميكانيكية التفاعلات العضوية وتطبيقاتها العملية الهادفة الى التطور العلمي للكيمياء العضوية.		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- تمكين الطلبة من الحصول على المعرفة والفهم للكيمياء العضوية. 2- تمكين الطلبة من الحصول على المعرفة والفهم للتراكيب الكيميائية للمركبات العضوية. 3- تمكين الطلبة من الحصول على المعرفة والفهم لميكانيكية التفاعلات العضوية. 4- تمكين الطلبة من الحصول على المعرفة والفهم للتجارب العملية للكيمياء العضوية. 5- تمكين الطلبة من الحصول على المعرفة والفهم للصفات الفيزيائية والكيميائية للمركبات العضوية.		
Indicative Contents المحتويات الإرشادية			
Course Description	-تزويد الطلبة بالاساسيات والمواضيع الاضافيه المتعلقة بمخرجات التفكير والتحليل الكيميائي العضوي. -تكوين مجموعات نقاشيه خلال المحاضرات لمناقشة مواضيع الكيمياء العضويه تتطلب التفكير والتحليل. -طلب حل مجموعة من الاسئله التفكيريه خلال المحاضرات مثل ماذا وكيف ومتى ولماذا لمواضيع محدد. -اعطاء الطلبة واجبات بيئيه تتطلب تفسيرات ذاتيه بطرق سببيه.		
Learning and Teaching Strategies			
استراتيجيات التعلم والتعليم			
Strategies	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	49	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	125		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Ultraviolet Spectrometry
Week 2	Introduction-Theory and Sample -handling
Week 3	characteristic - Absorption of Organic Compound
Week 4	Infrared Spectrometry
Week 5	Introduction-Theory and Sample -handling
Week 6	characteristic - Absorption of Organic Compound
Week 7	Midterm exam
Week 8	Proton nuclear magnetic Resonance Spectrometry
Week 9	Introduction-Theory- Apparatus
Week 10	Sample -handling
Week 11	Chemical Shift
Week 12	Simple Spin-Spin Coupling
Week 13	Protons on Heteroatoms
Week 14	Protons to other Nuclei
Week 15	Chemical shift equivalence and magnetic equivalence
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	1- R.T. Morrisson and R.N. Boyd, "Organic Chemistry", 6th ed., Paramount Communication Company (1992). 2- A.I.Vogel, "Text Book of Practical Organic Chemistry", 3rd ed., Longman Group Ltd., London (1974).	Yes
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>BIOCHEMISTRY 3</b>	<b>Module Delivery</b>	
<b>Module Type</b>	<b>CORE</b>	<b>Theory lab. Tutorial Seminar</b>	
<b>Module Code</b>	<b>CHE-47139</b>		
<b>ECTS Credits</b>	<b>5</b>		
<b>SWL (hr/sem)</b>	<b>150</b>		
<b>Module Level</b>	<b>4</b>		
<b>Administering Department</b>	Chemistry	<b>College</b>	Science
<b>Module Leader</b>	Dr. Firas T. Mahar Dr. Nagham Qasim Kadhim	<b>e-mail</b>	<a href="mailto:firastaher3@tu.edu.iq">firastaher3@tu.edu.iq</a> <a href="mailto:Nagham.kassim@tu.edu.iq">Nagham.kassim@tu.edu.iq</a>
<b>Module Leader's Acad. Title</b>	Prof. Assist. Prof	<b>Module Leader's Qualification</b>	Ph. D.
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>		<b>e-mail</b>	
<b>Review Committee Approval</b>	05/06/2023	<b>Version Number</b>	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	None	<b>Semester</b>	-
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	This module aims to teach you core concepts in biochemistry including topics on structure of proteins, enzyme kinetics and metabolic pathways. The module will also provide a background to fundamental aspects of chemistry. This module provides you with the core knowledge and skills to enhance performance in the area of biological chemistry		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Explain the basic concepts of biochemistry</li> <li>2. Recall the range and structures of biological molecules</li> <li>3. Summarise the relationship between chemical structure and biological function</li> <li>4. Identify metabolic pathways</li> <li>5. Communicate key practical skills relating specifically to biochemistry</li> <li>6. Illustrate essential elementary chemistry or structural organic chemistry</li> <li>7. Describe the basic principles of biochemistry/chemical biology</li> <li>8. Evaluate essential key facts and theory in a subdiscipline of the biosciences</li> <li>9. Describe and begin to evaluate aspects of biochemistry with reference to textbook material</li> <li>10. With guidance, deploy of established techniques of analysis, practical investigation and enquiry within biochemistry</li> </ol>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	Life is driven by biochemical reactions. Biochemistry is an introductory module providing the essentials for understanding all living processes. You will study protein structure, enzyme kinetics and basic metabolism; understanding how each of these processes function and shape the living cell. Practical sessions offer you vital hands-on experience, learning key techniques and how to apply them. Core biochemical experience is highly relevant to applications in biotechnology and medical science. This module provides the foundation from which you may progress to higher level modules in Metabolism, Analytical Techniques in Biochemistry, Bioinorganic Chemistry, and Pharmacology and Medicinal Chemistry.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	125		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	15% (15)		
	<b>Seminars</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	15% (15)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Overview of Metabolism & Major Metabolic Pathways of Glucose
Week 2	Digestion and absorption of carbohydrates, Glucose transporters, Regulation of blood sugar, Embden-Meyerhof pathway
Week 3	Glycolysis, Regulation, Cori's cycle, BPG shunt
Week 4	Fate of pyruvate, Gluconeogenesis, Glucose-alanine cycle, Glycogenolysis, Glycogen synthesis, Glycogen storage diseases
Week 5	Minor Metabolic Pathways of Carbohydrates
Week 6	Hexose monophosphate shunt pathway
Week 7	Glucose-6-phosphate dehydrogenase deficiency, Glucuronic acid pathway, Essential pentosuria, Polyol pathway
Week 8	Midterm exam
Week 9	Citric Acid Cycle
Week 10	Biological Oxidation and Electron Transport Chain
Week 11	Metabolism of Fatty Acids
Week 12	Metabolism of Fatty Acids continued
Week 13	Cholesterol and Lipoproteins
Week 14	MCFA, PUFA, Prostaglandins and Compound Lipids
Week 15	MCFA, PUFA, Prostaglandins and Compound Lipids continued
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Berg JM, Tymoczko JL, Stryer L (2012) <i>Biochemistry</i> , 7th Ed., Freeman ISBN 13: 978-1-4292-7635-1	
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>INDUSTRIAL CHEMISTRY 3</b>	<b>Module Delivery</b>	
<b>Module Type</b>	<b>CORE</b>	<b>Theory lab. Tutorial Seminar</b>	
<b>Module Code</b>	<b>CHE-47140</b>		
<b>ECTS Credits</b>	<b>4</b>		
<b>SWL (hr/sem)</b>	<b>150</b>		
<b>Module Level</b>	<b>4</b>		
<b>Administering Department</b>	Chemistry	<b>College</b>	Science
<b>Module Leader</b>	Dr. Ali O. Muhammed Dr. Raghad Mohammed Omer	<b>e-mail</b>	<a href="mailto:ali.omairi.1969@tu.edu.iq">ali.omairi.1969@tu.edu.iq</a> <a href="mailto:Raghad.m.omar@tu.edu.iq">Raghad.m.omar@tu.edu.iq</a>
<b>Module Leader's Acad. Title</b>	Assist. Prof. Lecture	<b>Module Leader's Qualification</b>	Ph. D. Ph.D.
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>		<b>e-mail</b>	
<b>Review Committee Approval</b>	05/06/2023	<b>Version Number</b>	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CHE-24122	Semester	5
Co-requisites module	None	Semester	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description			
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	<ul style="list-style-type: none"> <li>✓ Introduce students to aspects of industrial chemical manufacture and processing</li> <li>✓ To give an overview of the manufacture of important inorganic, polymer materials and pharmaceuticals</li> <li>✓ Give an overview of the petrochemical industry</li> <li>✓ Introduce students to aspects of industrial planning, safety and associated social issues</li> </ul>		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<p><i>On successful completion of this module the learner will be able to:</i></p> <ul style="list-style-type: none"> <li>✓ Describe the chemical industry and identify the distinguishing features of its component parts</li> <li>✓ Explain the importance and roles of route selection, process economics and process optimisation in chemical processing</li> <li>✓ Describe the industrial production of a number of important organic and inorganic chemicals</li> <li>✓ Evaluate environmental issues pertaining to the chemical industry</li> </ul>		
Indicative Contents المحتويات الإرشادية			
Course Description	This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.		
Learning and Teaching Strategies			
استراتيجيات التعلم والتعليم			
Strategies	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	78	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	المواد الخام الاولية للبتروكيماويات
Week 2	تركيب الغاز الطبيعي ، خصائص الغاز الطبيعي
Week 3	معالجة الغاز الطبيعي ، تركيب النفط الخام
Week 4	الغاز المصنع
Week 5	، الاكسدة الجزئية للهيدروكربونات ، استخدامات الغاز المصنع
Week 6	المواد الكيميائية التي تنتج من الغاز المصنع
Week 7	البتروكيماويات المنتجة من البارافينات
Week 8	Midterm exam
Week 9	البتروكيماويات المنتجة من الاولييفينات
Week 10	البروبلين ، استخدامات البروبلين
Week 11	البيوتاديين ، الكيماويات من البيوتاديين
Week 12	تكوين المطاط الطبيعي
Week 13	الاستيلين ، استخدام الاستيلين
Week 14	الكيماويات المصنعة من الاستيلين
Week 15	المواد الكيميائية المصنعة من BTX
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	تكنولوجيا البتروكيماويات . كوركيس عبد ال ادم	
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

Module Information			
معلومات المادة الدراسية			
Module Title	SPECTROSCOPY CHEMISTRY		Module Delivery
Module Type	CORE		Theory lab. Tutorial Seminar
Module Code	CHE-35129		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	4	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Layla A. Jaber		e-mail <a href="mailto:Layla.a.jaber@tu.edu.iq">Layla.a.jaber@tu.edu.iq</a>
Module Leader's Acad. Title	Prof.	Module Leader's Qualification	Ph. D.
Module Tutor	None		e-mail None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	None	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	يهدف المقرر الى تعريف الطلبة ما هي ميكانيك الكم الحسابي والنظري ومعرفة أهمية الطيف الجزيئي بالنسبة للطلاب الكيميائيين		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ تمكين الطلبة من:</li> <li>✓ معرفة مفهوم الجزيئة وتشكيلها وانواع الواصل التي تشكل التركيب الجزيئي للمواد</li> <li>✓ فهم ومعرفة النظريات الخاصة بالتركيب الجزيئي ومن ثم دراسة المطيافية الجزيئية واعطاء مقدمة عن مكونات الطيف الجزيئي ومميزاته</li> <li>✓ الحصول على المعرفة والفهم لأساسيات الخاصة بموضوع التركيب الجزيئي والأطياف الجزيئية المتضمنة اطياف دورانية واهتزازية والكترونية .</li> <li>✓ التعرف على العمليات الإشعاعية الخاصة ما بين مستويات الطاقة الجزيئية (الامتصاص والفلورة والفسفرة ) وايضا انواع العمليات الإشعاعية</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	48	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	3.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	100		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to atomic physics
Week 2	Electromagnetic Radiation, Electromagnetic Spectrum
Week 3	Atomic structure
Week 4	Emission and Absorption Spectroscopy
Week 5	Types of Spectra
Week 6	Molecular spectroscopy
Week 7	Diatomic molecules
Week 8	<b>Midterm exam</b>
Week 9	Structure & electronic states
Week 10	Rotational and Vibrational Transition
Week 11	Quantized rotational energy levels
Week 12	Quantized rotational energy levels
Week 13	Rotational Spectra Vibrational States
Week 14	. Rotational and Vibrational Transition
Week 15	Jablonskii diagram Photophysical processes Spectrophotometers setup
Week 16	<b>Final Exam</b>

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	“Molecular spectroscopy”, Jack D.Graybeal “Atomic Physics”, Max Born	Yes
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>Instrumental analysis 2</b>		<b>Module Delivery</b>
<b>Module Type</b>	CORE		Theory Tutorial Seminar
<b>Module Code</b>	CHE- 48143		
<b>ECTS Credits</b>	6		
<b>SWL (hr/sem)</b>	150		
<b>Module Level</b>	4	<b>Semester (s) offered</b>	8
<b>Administering Department</b>	Chemistry	<b>College</b>	Science
<b>Module Leader</b>	<b>Dr. Sarhan Ali Salman</b>	<b>e-mail</b>	<a href="mailto:sarhan.ali@tu.edu.iq">sarhan.ali@tu.edu.iq</a>
<b>Module Leader's Acad. Title</b>	Assist. Prof	<b>Module Leader's Qualification</b>	Ph. D. Ph.D.
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>		<b>e-mail</b>	
<b>Review Committee Approval</b>	05/06/2023	<b>Version Number</b>	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CHE-24120	Semester	5
Co-requisites module	None	Semester	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	To effectively problem-solve and critically evaluate analytical techniques such as Chromatography, Electroanalysis, Microscopy and Spectroscopy		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<p>On completion of this module, students are expected to be able to:</p> <ol style="list-style-type: none"> <li>1 Critically evaluate and appraise a range of advanced analytical instrumentation.</li> <li>2 Critically appraise and discuss conventional techniques for the solution of a given analytical problem.</li> <li>3 Demonstrate critical professional competence in oral presentations and data handling skills for the solution of a given analytical problem.</li> </ol>		
Indicative Contents المحتويات الإرشادية			
Course Description	<p>This module presents a review of standardisation and use of commoner reagents in acid/base, redox, precipitation and complexation reactions It will also offer an Introduction to gravimetry, principles, instrumentation and applications of UV/VIS, IR and atomic absorption spectrometry as well as a comparative overview of methods.</p> <p>In addition, the module will include coverage of the following: application of Beer's Law to calibration and to mixtures, brief introduction to principles of chromatography and sorption processes - partition, ion exchange etc, columns, detector types, mobile and stationary phases, outline of high performance liquid chromatography, qualitative and quantitative analysis</p> <p>Also, this module provides an introduction to some of the concepts related to (i) mass balance calculations -applications to straightforward batch processes and steady state flow systems with and without chemical reactions, examples from chemical processing and from the environment-, (ii) statistics and chemical measurement -precision, accuracy and errors, mean, standard deviation and confidence limits, propagation of errors, error in linear calibration-, and (iii) instrument computer interfacing and on-line use of microchips in the measurement, collection and evaluation of chemical data.</p>		
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	71	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.7
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	15% (15)		
	<b>Seminars</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	15% (15)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	UV and visible spectrophotometry ,principle ,instrumentation and application.
Week 2	UV and visible spectrophotometry ,principle ,instrumentation and application.
Week 3	UV and visible spectrophotometry ,principle ,instrumentation and application.
Week 4	IR spectrophotometry ,principle ,instrumentation and application.
Week 5	IR spectrophotometry ,principle ,instrumentation and application.
Week 6	IR spectrophotometry ,principle ,instrumentation and application.
Week 7	Phosphorescence
Week 8	Midterm exam
Week 9	chemiluminescence
Week 10	Turbidimetry and Nephelometry
Week 11	Flow injection
Week 12	Flam atomic emission .flame atomic, absorption non flame, atomic absorption
Week 13	plasma atomic
Week 14	X-ray emission ,X-ray fluorescence,
Week 15	Derivative spectrometry and laser spectrometry
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Analytical Chemistry 8e by Douglas A. Skoog	
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>ORGANIC IDENTIFICATION</b>		<b>Module Delivery</b>
<b>Module Type</b>	CORE		<b>Theory lab. Tutorial Seminar</b>
<b>Module Code</b>	CHE-48144		
<b>ECTS Credits</b>	5		
<b>SWL (hr/sem)</b>	125		
<b>Module Level</b>	4	<b>Semester (s) offered</b>	
<b>Administering Department</b>	Chemistry	<b>College</b>	Science
<b>Module Leader</b>	Dr. Ibtihal Q. Dr. Ayad Sadi Hameed	<b>e-mail</b>	
<b>Module Leader's Acad. Title</b>	Professor Professor	<b>Module Leader's Qualification</b>	Ph. D. Ph.D.
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>		<b>e-mail</b>	
<b>Review Committee Approval</b>	05/06/2023	<b>Version Number</b>	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	CHE-24121	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	تعليم الطالب التفاعلات الكيميائية العضوية والتراكيب الكيميائية ومعرفة البنية للمركبات العضوية وكيفية توضيح ميكانيكية التفاعلات العضوية وتطبيقاتها العملية الهادفة الى التطور العلمي للكيمياء العضوية.		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	6- تمكين الطلبة من الحصول على المعرفة والفهم للكيمياء العضوية. 7- تمكين الطلبة من الحصول على المعرفة والفهم للتراكيب الكيميائية للمركبات العضوية. 8- تمكين الطلبة من الحصول على المعرفة والفهم لميكانيكية التفاعلات العضوية. 9- تمكين الطلبة من الحصول على المعرفة والفهم للتجارب العملية للكيمياء العضوية. 10- تمكين الطلبة من الحصول على المعرفة والفهم للصفات الفيزيائية والكيميائية للمركبات العضوية.		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	-تزويد الطلبة بالاساسيات والمواضيع الاضافيه المتعلقة بمخرجات التفكير والتحليل الكيميائي العضوي. -تكوين مجموعات نقاشيه خلال المحاضرات لمناقشة مواضيع الكيمياء العضويه تتطلب التفكير والتحليل. -طلب حل مجموعة من الاسئله التفكيريه خلال المحاضرات مثل ماذا وكيف ومتى ولماذا لمواضيع محدد. -اعطاء الطلبة واجبات بيتيه تتطلب تفسيرات ذاتيه بطرق سببيه.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.3
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	49	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	125		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	<b>Material Covered</b>
<b>Week 1</b>	Ultraviolet Spectrometry
<b>Week 2</b>	Introduction-Theory and Sample -handling
<b>Week 3</b>	characteristic - Absorption of Organic Compound
<b>Week 4</b>	Infrared Spectrometry
<b>Week 5</b>	Introduction-Theory and Sample -handling
<b>Week 6</b>	characteristic - Absorption of Organic Compound
<b>Week 7</b>	Midterm exam
<b>Week 8</b>	Proton nuclear magnetic Resonance Spectrometry
<b>Week 9</b>	Introduction-Theory- Apparatus
<b>Week 10</b>	Sample -handling
<b>Week 11</b>	Chemical Shift
<b>Week 12</b>	Simple Spin-Spin Coupling
<b>Week 13</b>	Protons on Heteroatoms
<b>Week 14</b>	Protons to other Nuclei
<b>Week 15</b>	Chemical shift equivalence and magnetic equivalence
<b>Week 16</b>	<b>Final Exam</b>

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	<b>Text</b>	<b>Available in the Library?</b>
<b>Required Texts</b>	1- R.T. Morrisson and R.N. Boyd, "Organic Chemistry", 6th ed., Paramount Communication Company (1992). 2- A.I.Vogel, "Text Book of Practical Organic Chemistry", 3rd ed., Longman Group Ltd., London (1974).	<b>Yes</b>
<b>Recommended Texts</b>		
<b>Websites</b>		



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## MODULE DESCRIPTOR

<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>BIOCHEMISTRY 3</b>		<b>Module Delivery</b>
<b>Module Type</b>	CORE		<b>Theory lab. Tutorial Seminar</b>
<b>Module Code</b>	CHE-48145		
<b>ECTS Credits</b>	5		
<b>SWL (hr/sem)</b>	150		
<b>Module Level</b>	4	<b>Semester (s) offered</b>	
<b>Administering Department</b>	Chemistry	<b>College</b>	Science
<b>Module Leader</b>	Dr. Firas T. Mahar Dr. Nagham Qasim Kadhim	<b>e-mail</b>	<a href="mailto:firastaher3@tu.edu.iq">firastaher3@tu.edu.iq</a> <a href="mailto:Nagham.kassim@tu.edu.iq">Nagham.kassim@tu.edu.iq</a>
<b>Module Leader's Acad. Title</b>	Prof. Assist. Prof	<b>Module Leader's Qualification</b>	Ph. D.
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>		<b>e-mail</b>	
<b>Review Committee Approval</b>	05/06/2023	<b>Version Number</b>	1.0

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	-
Co-requisites module	None	Semester	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	This module aims to teach you core concepts in biochemistry including topics on structure of proteins, enzyme kinetics and metabolic pathways. The module will also provide a background to fundamental aspects of chemistry. This module provides you with the core knowledge and skills to enhance performance in the area of biological chemistry		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<ol style="list-style-type: none"> <li>1. Explain the basic concepts of biochemistry</li> <li>2. Recall the range and structures of biological molecules</li> <li>3. Summarise the relationship between chemical structure and biological function</li> <li>4. Identify metabolic pathways</li> <li>5. Communicate key practical skills relating specifically to biochemistry</li> <li>6. Illustrate essential elementary chemistry or structural organic chemistry</li> <li>7. Describe the basic principles of biochemistry/chemical biology</li> <li>8. Evaluate essential key facts and theory in a subdiscipline of the biosciences</li> <li>9. Describe and begin to evaluate aspects of biochemistry with reference to textbook material</li> <li>10. With guidance, deploy of established techniques of analysis, practical investigation and enquiry within biochemistry</li> </ol>		
Indicative Contents المحتويات الإرشادية			
Course Description	Life is driven by biochemical reactions. Biochemistry is an introductory module providing the essentials for understanding all living processes. You will study protein structure, enzyme kinetics and basic metabolism; understanding how each of these processes function and shape the living cell. Practical sessions offer you vital hands-on experience, learning key techniques and how to apply them. Core biochemical experience is highly relevant to applications in biotechnology and medical science. This module provides the foundation from which you may progress to higher level modules in Metabolism, Analytical Techniques in Biochemistry, Bioinorganic Chemistry, and Pharmacology and Medicinal Chemistry.		
Learning and Teaching Strategies استراتيجيات التعلم والتعليم			
Strategies	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	79	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	125		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	15% (15)		
	<b>Seminars</b>	2	10% (10)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	15% (15)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Overview of Metabolism & Major Metabolic Pathways of Glucose
Week 2	Digestion and absorption of carbohydrates, Glucose transporters, Regulation of blood sugar, Embden-Meyerhof pathway
Week 3	Glycolysis, Regulation, Cori's cycle, BPG shunt
Week 4	Fate of pyruvate, Gluconeogenesis, Glucose-alanine cycle, Glycogenolysis, Glycogen synthesis, Glycogen storage diseases
Week 5	Minor Metabolic Pathways of Carbohydrates
Week 6	Hexose monophosphate shunt pathway
Week 7	Glucose-6-phosphate dehydrogenase deficiency, Glucuronic acid pathway, Essential pentosuria, Polyol pathway
Week 8	Midterm exam
Week 9	Citric Acid Cycle
Week 10	Biological Oxidation and Electron Transport Chain
Week 11	Metabolism of Fatty Acids
Week 12	Metabolism of Fatty Acids continued
Week 13	Cholesterol and Lipoproteins
Week 14	MCFA, PUFA, Prostaglandins and Compound Lipids
Week 15	MCFA, PUFA, Prostaglandins and Compound Lipids continued
Week 16	Final Exam

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Berg JM, Tymoczko JL, Stryer L (2012) <i>Biochemistry</i> , 7th Ed., Freeman ISBN 13: 978-1-4292-7635-1	
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>INDUSTRIAL CHEMISTRY 4</b>		<b>Module Delivery</b>
<b>Module Type</b>	CORE		<b>Theory lab. Tutorial Seminar</b>
<b>Module Code</b>	CHE-48146		
<b>ECTS Credits</b>	6		
<b>SWL (hr/sem)</b>	150		
<b>Module Level</b>	4	<b>Semester (s) offered</b>	
<b>Administering Department</b>	Chemistry	<b>College</b>	Science
<b>Module Leader</b>	Dr. Ali O. Muhammed Dr. Raghad Mohammed Omer	<b>e-mail</b>	<a href="mailto:ali.omairi.1969@tu.edu.iq">ali.omairi.1969@tu.edu.iq</a> <a href="mailto:Raghad.m.omar@tu.edu.iq">Raghad.m.omar@tu.edu.iq</a>
<b>Module Leader's Acad. Title</b>	Assist. Prof. Lecture	<b>Module Leader's Qualification</b>	Ph. D. Ph.D.
<b>Module Tutor</b>	None	<b>e-mail</b>	None
<b>Peer Reviewer Name</b>		<b>e-mail</b>	
<b>Review Committee Approval</b>	05/06/2023	<b>Version Number</b>	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	CHE-24122	Semester	5
Co-requisites module	None	Semester	-
Module Aims, Learning Outcomes, Indicative Contents and Brief Description			
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
Module Aims أهداف المادة الدراسية	<ul style="list-style-type: none"> <li>✓ Introduce students to aspects of industrial chemical manufacture and processing</li> <li>✓ To give an overview of the manufacture of important inorganic, polymer materials and pharmaceuticals</li> <li>✓ Give an overview of the petrochemical industry</li> <li>✓ Introduce students to aspects of industrial planning, safety and associated social issues</li> </ul>		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	<p><i>On successful completion of this module the learner will be able to:</i></p> <ul style="list-style-type: none"> <li>✓ Describe the chemical industry and identify the distinguishing features of its component parts</li> <li>✓ Explain the importance and roles of route selection, process economics and process optimisation in chemical processing</li> <li>✓ Describe the industrial production of a number of important organic and inorganic chemicals</li> <li>✓ Evaluate environmental issues pertaining to the chemical industry</li> </ul>		
Indicative Contents المحتويات الإرشادية			
Course Description	This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.		
Learning and Teaching Strategies			
استراتيجيات التعلم والتعليم			
Strategies	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	78	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	5.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	150		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	المواد الخام الاولية للبتروكيمياويات
Week 2	تركيب الغاز الطبيعي ، خصائص الغاز الطبيعي
Week 3	معالجة الغاز الطبيعي ، تركيب النفط الخام
Week 4	الغاز المصنع
Week 5	، الاكسدة الجزئية للهيدروكربونات ، استخدامات الغاز المصنع
Week 6	المواد الكيميائية التي تنتج من الغاز المصنع
Week 7	البتروكيمياويات المنتجة من البارافينات
Week 8	Midterm exam
Week 9	البتروكيمياويات المنتجة من الاوليفينات
Week 10	البروبلين ، استخدامات البروبلين
Week 11	البيوتاديين ، الكيماويات من البيوتاديين
Week 12	تكوين المطاط الطبيعي
Week 13	الاستيلين ، استخدام الاستيلين
Week 14	الكيماويات المصنعة من الاستيلين
Week 15	المواد الكيميائية المصنعة من BTX
Week 16	Final Exam

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	تكنولوجيا البتروكيمياويات . كوركيس عبد ال ادم	
Recommended Texts		
Websites		



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## MODULE DESCRIPTOR

Module Information			
معلومات المادة الدراسية			
Module Title	QUANTUM CHEMISTRY		Module Delivery
Module Type	CORE		Theory lab. Tutorial Seminar
Module Code	CHE-48147		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	4	Semester (s) offered	
Administering Department	Chemistry	College	Science
Module Leader	Dr. Layla A. Jaber	e-mail	<a href="mailto:Layla.a.jaber@tu.edu.iq">Layla.a.jaber@tu.edu.iq</a>
Module Leader's Acad. Title	Prof.	Module Leader's Qualification	Ph. D.
Module Tutor	None	e-mail	None
Peer Reviewer Name		e-mail	
Review Committee Approval	05/06/2023	Version Number	1.0

<b>Relation With Other Modules</b> العلاقة مع المواد الدراسية الأخرى			
<b>Prerequisite module</b>	None	<b>Semester</b>	5
<b>Co-requisites module</b>	None	<b>Semester</b>	-
<b>Module Aims, Learning Outcomes, Indicative Contents and Brief Description</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر			
<b>Module Aims</b> أهداف المادة الدراسية	يهدف المقرر الى تعريف الطلبة ما هي ميكانيك الكم الحسابي والنظري ومعرفة أهمية الطيف الجزيئي بالنسبة للطلاب الكيميائيين		
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<ul style="list-style-type: none"> <li>✓ تمكين الطلبة من:</li> <li>✓ معرفة مفهوم الجزيئة وتشكيلها وانواع الواصر التي تشكل التركيب الجزيئي للمواد</li> <li>✓ فهم ومعرفة النظريات الخاصة بالتركيب الجزيئي ومن ثم دراسة المطيافية الجزيئية واعطاء مقدمة عن مكونات الطيف الجزيئي ومميزاته</li> <li>✓ الحصول على المعرفة والفهم لأساسيات الخاصة بموضوع التركيب الجزيئي والأطياف الجزيئية المتضمنة اطياف دورانية واهتزازية والكترونية .</li> <li>✓ التعرف على العمليات الإشعاعية الخاصة ما بين مستويات الطاقة الجزيئية (الامتصاص والفلورة والفسفرة ) وايضا انواع العمليات الإشعاعية</li> </ul>		
<b>Indicative Contents</b> المحتويات الإرشادية			
<b>Course Description</b>	This module provides an overview of the industrial production of major chemicals, and their use in society. The focus is on the chemical aspects of processes with a small components looking at economics, societal effects, health and safety and engineering. The delivery is split into the broad areas of bulk inorganic chemicals, polymeric materials, pharmaceuticals and petrochemicals.		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The learning and teaching <b>strategy</b> is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.		

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	48	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعياً	3.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	100		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time (hr)</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	2	10% (10)		
	<b>Assignments</b>	4	10% (10)		
	<b>Lab</b>	2	20% (20)		
<b>Summative assessment</b>	<b>Midterm Exam</b>	1	10% (10)		
	<b>Final Exam</b>	3	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to atomic physics
Week 2	Electromagnetic Radiation, Electromagnetic Spectrum
Week 3	Atomic structure
Week 4	Emission and Absorption Spectroscopy
Week 5	Types of Spectra
Week 6	Molecular spectroscopy
Week 7	Diatomic molecules
Week 8	<b>Midterm exam</b>
Week 9	Structure & electronic states
Week 10	Rotational and Vibrational Transition
Week 11	Quantized rotational energy levels
Week 12	Quantized rotational energy levels
Week 13	Rotational Spectra Vibrational States
Week 14	. Rotational and Vibrational Transition
Week 15	Jablonskii diagram Photophysical processes Spectrophotometers setup
Week 16	<b>Final Exam</b>

## Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	“Molecular spectroscopy”, Jack D.Graybeal “Atomic Physics”, Max Born	Yes
Recommended Texts		
Websites		

**APPENDIX:**

<b>GRADING SCHEME</b> مخطط الدرجات				
<b>Group</b>	<b>Grade</b>	<b>التقدير</b>	<b>Marks (%)</b>	<b>Definition</b>
<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 - 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 - 89	Above average with some errors
	<b>C - Good</b>	جيد	70 - 79	Sound work with notable errors
	<b>D - Satisfactory</b>	متوسط	60 - 69	Fair but with major shortcomings
	<b>E - Sufficient</b>	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	<b>FX – Fail</b>	مقبول بقرار	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	راسب	(0-44)	Considerable amount of work required
<b>Note:</b>				
<p>NB 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.</p>				

**Tikrit UNIVERSITY**

**جامعة تكريت**



**Bachelor of Science in Chemistry**

**بكالوريوس علوم في الكيمياء**



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## 1- About the Department:

The Department of Chemistry was established in the College of Science in 1999. The study period in the department is four years. The department grants a bachelor's degree in Chemistry Science after the student has completed a systematic scientific preparation that qualifies him/her to keep pace with technical progress in the field of scientific research and to provide service to the public and private sectors, such as Ministry of Oil, Ministry of Health.

The B.Sc. in Chemistry program provides students with a strong foundation in the traditional branches of chemistry, including analytical, organic, inorganic, and physical and biochemistry. The program also emphasizes the development of IT and communication skills. Students develop practical skills through laboratory courses utilizing state-of-the-art equipment. An internship placement provides students with training and preparation for the workplace. All students obtain experience in research through a project completed in their final year. Graduates of the program are well prepared to take up positions in the chemical and pharmaceutical industries or pursue further studies at the graduate level.

The bachelor's degree includes four periods; each period includes two semesters meaning for the students to be graduated, they must have completed eight semesters. The Department of Chemistry grants B. Sc. in Chemistry.

## 2- Mission & Vision Statement

### *i- Mission Statement*

- ✓ To create and maintain programs of excellence in the areas of research, education, and public outreach.
- ✓ To promote, inspire and nurture the fundamentals of chemistry through different courses offered for the basic sciences, and applied sciences students.
- ✓ Our specific goal is to become a nationally recognized center of chemical sciences for modern education with a state of art centralized research facility.

## **ii- Vision**

To establish the department as one of the best chemistry programs in Iraq with acknowledged excellence in research, and instruction, intellectual and physical location at the nexus between basic sciences, and applied sciences, which enables various multidisciplinary projects and interactions.

### **3- Program Goals**

- 1-** Provide chemistry majors with a strong background in the six major sub-disciplines of chemistry – organic, inorganic, physical, Industrial, analytical, and biochemistry – with up-to-date coursework in each area.
- 2-** Provide students with relevant laboratory and research experiences designed to deepen their understanding of chemical principles, while simultaneously teaching students safe, responsible laboratory practices.
- 3-** Demonstrate the use of modern technology in chemistry by giving students direct, hands-on experiences with up-to-date instrumentation, computer software, and methods of information retrieval, both in coursework and in the laboratory setting.
- 4-** Provide opportunities for students to become familiar with the chemical professions and professional activities of practicing chemists and biochemists.
- 5-** Provide students with a more holistic view of chemistry through an emphasis on its interdisciplinary nature by using specific examples to illustrate connections between chemistry and other science areas.

### **4- Program Specifications:**

The Chemistry program given by Tikrit University is prepared to assist you in acquiring the academic foundation required for a career as a professional chemist in the refineries, health science, industrial, and academic fields.

You will develop the knowledge and abilities necessary to demonstrate an in-depth understanding of advanced topics in the different main branches of chemistry, i.e., Organic, Inorganic, and Physical Chemistry. Also, devise suitable experimental methods for their research project. And demonstrate the ability to

work independently and effectively disseminate the research findings using effective communication skills.

<b>Program code:</b>	B. Sc. - CHEM	<b>ECTS</b>	240
<b>Duration:</b>	4 levels, 8 Semesters	<b>Method of Attendance:</b>	Full Time

## 5- Student Learning Outcomes

- 1- To understand the fundamental concepts and principles of chemistry.
- 2- To recognize the basic theories of chemical methods and techniques.
- 3- To define and reproduce scientific information about chemical topics.
- 4- To integrate and evaluate chemical information and data in order to gain a coherent understanding of theory and practice.
- 5- To analyze, interpret, and chemical data by linking chemical and physical concepts with mathematical expressions.
- 6- To propose and apply creative solutions to chemical problems with limited guidance.
- 7- To develop applications of chemical concepts to other areas of science, technology, and industry.
- 8- To employ developed information and communications technology in gathering and interpreting chemical information and ideas.

## 6- Academic Staff

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## 7- Credits, Grading and GPA

### *i. Credits*

Tikrit University follows Bologna Learning Process with the European Credit Transfer System (ECTS) credit system. The total degree program number of ECTS is **240, 30 ECTS** per semester. **1 ECTS** is equivalent to **25** student workload, including structured and unstructured workload.

### *ii. Grading*

Before the evaluation, the results are divided into two subgroups: pass and fail. Therefore, the results are independent of the students who failed a course. The grading system is defined as follows:

GRADING SCHEME مخطط الدرجات				
Group	Grade	التقدير	Marks (%)	Definition
<b>Success Group (50 - 100)</b>	A – Excellent	امتياز	90 - 100	Outstanding Performance
	B - Very Good	جيد جدا	80 - 89	Above average with some errors
	C – Good	جيد	70 - 79	Sound work with notable errors
	D – Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E – Sufficient	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	FX – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
<b>Note:</b>				
NB 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.				

### iii. Calculation of the Grade Point Average (GPA)

1. The GPA is calculated by the summation of each module score multiplied by its ECTS, all are divided by the program total ECTS.

GPA of a 4-year B.Sc. degrees:

$$\text{GPA} = [ (1\text{st module score} \times \text{ECTS}) + (2\text{nd module score} \times \text{ECTS}) + \dots ] / 240$$

## 8- Curriculum/Modules

### Semester 1 | 30 ECTS

No.	Module Code	Module Name in English	اسم المادة الدراسية	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
				hr/sem	hr/sem	hr/sem			
1	CHE-1101	Qualitative analytical chemistry	الكيمياء التحليل النوعي	109	66	175	7.00	C	
2	CHE-1102	Inorganic Chemistry I	الكيمياء اللاعضوية I	79	71	150	6.00	C	
3	CHE-1103	Physics	الفيزياء	93	57	150	6.00	B	
4	CHE-1104	Labortary Sefty	السلامة والامن الكيميائي	48	27	75	3.00	B	
5	UoT- 1105	Human and democracy	حقوق انسان والديمقراطية	48	52	100	4.00	S	
6	UoT-1106	Mathematics I	الرياضيات I	63	37	100	4.00	S	
				440	310	750	30.00		

### Semester 2 | 30 ECTS

No.	Module Code	Module Name in English	اسم المادة الدراسية	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
				hr/sem	hr/sem	hr/sem			
1	CHE-1217	Volumetric analytical chemistry	الكيمياء التحليل الحجمي	109	66	175	7.00	C	CHE-1101
2	CHE-1218	Inorganic Chemistry II	اللاعضوية II	79	71	150	6.00	C	CHE-1102
3	CHE-1209	Statistic	الاحصاء	63	37	100	4.00	B	
4	CHE-12010	Cytology	علم الخلية	93	57	150	6.00	B	
5	CoS-12011	Computers program I	برمجة الحاسوب	48	27	75	3.00	B	
6	UoT-12012	Language I	اللغات	63	37	100	4.00	S	
				455	295	750	30.00		

### Semester 3 | 30 ECTS

No.	Module Code	Module Name in English	اسم المادة الدراسية	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
				hr/sem	hr/sem	hr/sem			
1	CHE-23113	Gravity Analytical chemistry	الكيمياء التحليل الوزني	79	71	150	6.00	C	CHE-1217
2	CHE-23114	Inorganic Chemistry III	الكيمياء اللاعضوية 3	94	56	150	6.00	C	CHE-1218
3	CHE-23115	Thermodynamic Chemistry I	كيمياء الترموديناميك 1	94	56	150	6.00	C	
4	CHE-23116	Organic Chemistry I	الكيمياء العضوية 1	79	71	150	6.00	C	
5	CoS-23117	Computers program II	برمجة الحاسوب 2	48	27	75	3.00	B	CoS-12011
6	CoS-23118	Mathematics II	رياضيات II	48	27	75	3.00	B	UoT-1106
				442	308	750	30.00		

### Semester 4 | 30 ECTS

No.	Module Code	Module Name in English	اسم المادة الدراسية	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
				hr/sem	hr/sem	hr/sem			
1	CHE-24119	Separations methods	طرائق فصل	94	56	150	6.00	C	CHE-23113
2	CHE-24120	Inorganic Chemistry IV	الكيمياء اللاعضوية 4	94	56	150	6.00	C	CHE-23114
3	CHE-24121	Thermodynamic Chemistry II	كيمياء الترموديناميك 2	79	71	150	6.00	C	CHE-23115
4	CHE-24122	Organic Chemistry II	الكيمياء العضوية 2	79	71	150	6.00	C	CHE-23116
5	CoS-24123	Nanotechnology	نانو تكنولوجيا	48	27	75	3.00	C	
6	UoT-24124	English language	اللغة الانكليزية	48	27	75	3.00		UoT-12012
				442	308	750	30.00		

## Semester 5 | 30 ECTS

No.	Module Code	Module Name in English	اسم المادة الدراسية	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
				hr/sem	hr/sem	hr/sem			
1	CHE-35125	Coordination Chemistry I	الكيمياء التناسقية 1	79	71	150	6.00	C	CHE-24120
2	CHE-35126	Kinetic Chemistry	الكيمياء الحركية	79	71	150	6.00	C	CHE-24121
3	CHE-35127	Organic Chemistry 3	الكيمياء العضوية 3	79	71	150	6.00	C	CHE-24122
4	CHE-35128	Biochemistry 1	الكيمياء الحياتية 1	79	71	150	6.00	C	
5	CHE-35029	Principles of Industrial Chemistry	اسس الكيمياء الصناعية	48	52	100	4.00	C	
6	CHE-35030	Selective 1	الاختياري 1	33	17	50	2.00	C	
				397	353	750	30.00		

## Semester 6 | 30 ECTS

No.	Module Code	Module Name in English	اسم المادة الدراسية	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
				hr/sem	hr/sem	hr/sem			
1	CHE-36131	Coordination Chemistry II	الكيمياء التناسقية 2	79	71	150	6.00	C	CHE-25125
2	CHE-36132	Electric chemistry	الكيمياء الكهربائية	79	71	150	6.00	C	CHE-25126
3	CHE-36133	Organic chemistry 4	الكيمياء العضوية 4	79	71	150	6.00	C	CHE-25127
4	CHE-36134	Biochemistry 2	الكيمياء الحياتية 2	79	71	150	6.00	C	CHE-25128
5	CHE-36135	Application of Industrial Chemistry	تطبيقات الكيمياء الصناعية	48	52	100	4.00	C	CHE-25029
6	CHE-36036	Research Methodology	منهجية البحث	33	17	50	2.00	B	
				397	353	750	30.00		

## Semester 7 | 30 ECTS

No.	Module Code	Module Name in English	اسم المادة الدراسية	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
				hr/sem	hr/sem	hr/sem			
1	CHE-47137	Instrumental analysis 1	كيمياء التحليل الالي 1	79	71	150	6.00	C	
2	CHE-47138	Organic Identification 1	التشخيص العضوي 1	79	46	125	5.00	C	CHE-36133
3	CHE-47139	Biochemistry 3	الكيمياء الحياتية 3	79	46	125	5.00	C	CHE-36134
4	CHE-47140	Industrial chemistry3	الكيمياء الصناعية 3	78	72	150	6.00	C	CHE-36135
5	CHE-47141	Spectroscopy chemistry	كيمياء الاطياف	48	52	100	4.00	C	
6	CHE-47042	Research project	مشروع البحث	33	67	100	4.00	B	
				396	354	750	30.0		

## Semester 8 | 30 ECTS

No.	Module Code	Module Name in English	اسم المادة الدراسية	SSWL	USSWL	SWL	ECTS	Module Type	Prerequisite Module(s) Code
				hr/sem	hr/sem	hr/sem			
1	CHE-48143	Instrumental analysis 2	كيمياء التحليل الالي 2	79	71	150	6.00	C	CHE-47137
2	CHE-48144	Identification 2	التشخيص العضوي 2	79	46	125	5.00	C	CHE-47138
3	CHE-48145	Biochemistry 4	الكيمياء الحياتية 4	79	46	125	5.00	C	CHE-47139
4	CHE-48146	Industrial chemistry 4	الكيمياء الصناعية 4	78	72	150	6.00	C	CHE-47140
5	CHE-48147	Quantum chemistry	كيمياء الكم	48	52	100	4.00	C	CHE-47141
6	CHE-48148	selective 2	الاختياري 2	33	67	100	4.00	C	
				396	354	750	30.0		

## 9- Contact

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