

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

المرحلة الثانية- قسم الكيمياء –كلية العلوم –جامعه ذي قار

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Physical Chemistry/Course 1</b> الكيمياء الفيزيائية/الكورس الاول		Module Delivery
			<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial
Administering Department	Department of Chemistry قسم الكيمياء	College	College of Sciences كلية العلوم
Module Leader	Saad Shahad Mohammed سعد شهد محمد	e-mail	Saad.sh_chem@sci.utq.edu.iq
Module Leader's Acad. Title	Asst.Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	15/04/2024		

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Aims</b> أهداف المادة الدراسية	To enable students to evaluate the principles and applications of physical chemistry and thermodynamic processes. تمكين الطلبة من فهم وتقييم مبادئ وتطبيقات الكيمياء الفيزيائية وعمليات الترموديناميك
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	On completion of this module, students are expected to be able to: 1. Discuss the principles, applications and advantages of physical chemistry principles and techniques. 2. Perform chemical calculations and solutions for thermodynamic problems. عند اكمال هذا الكورس يتوقع من الطالب ان يكون قادرا على: 1- مناقشة مبادئ وتطبيقات وفوائد الكيمياء الفيزيائية وتقنياتها. 2- يستطيع الطالب ان يجري الحسابات الكيمياوية والحلول لمسائل الترموديناميك.
<b>Indicative Contents</b> المحتويات الإرشادية	physical chemistry: gases, zeroth law, heat, work, thermodynamic, first law, enthalpy, internal energy, heat capacities, second law, entropy, gibbs energy, chemical potential, third law of thermodynamic. الكيمياء الفيزيائية: الغازات, القانون الصفري, الحرارة والشغل, الترموديناميك, القانون الاول للترموديناميك, الانتالبي, الطاقة الداخلية, السعة الحرارية, القانون الثاني للترموديناميك, الانتروبي, طاقة كبس الحرة, الطاقة الكامنة, القانون الثالث للترموديناميك.

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students. الاستراتيجية المتبعة في التعامل مع هذه المادة هي تشجيع الطلبة على المشاركة في التمارين. في نفس الوقت يتم تطوير قابلياتهم الذهنية وتفكيرهم الحاد والسريع في حل المسائل. هذا ممكن ان يكون خلال دروس المناقشة والمحاضرات التي تتضمن بعض الفعاليات البسيطة.
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## Delivery Plan (Weekly Syllabus)

## المناهج الاسبوعي النظري

	Material Covered
Week 1	Chemical Equilibrium: calculate equilibrium constants for homogenous reactions, Relation between $K_c$ , $K_p$ and $K_x$ , Characteristics of equilibrium constants, The Le Chatelier principle التوازن الكيميائي, حساب ثابت التوازن للتفاعل الكيميائي المتجانس بين $K_c$ , $K_p$ and $K_x$ , مميزات ثابت التوازن.
Week 2	The relation between Gibbs free energy and equilibrium constant. Determination of equilibrium constant for gas reactions, Chemical equilibrium for heterogeneous reactions العلاقة بين طاقة كبس الحرة وثابت التوازن التوازن الكيميائي للتفاعلات غير المتجانسة
Week 3	Determination of equilibrium constants in homogeneous liquid system. Chemical equilibrium for heterogeneous reactions. Calculation of chemical equilibrium by indirect method. Effect of temperature on chemical equilibrium constants. ايجاد ثوابت التوازن الكيميائي للأنظمة المتجانسة, التوازن الكيميائي للتفاعلات غير المتجانسة حسابات التوازن الكيميائي بالطريقة غير المباشرة تأثير درجة الحرارة على ثوابت التوازن الكيميائي
Week 4	Phase Equilibrium: One component system. Phase diagram for water. Clapeyron equation. Clausius – Clapeyron equation التوازن الطوري: نظام مكون واحد؟ مخطط التحول الطوري للماء, معادلة كلايبرن, معادلة كلايزيس-كلايبرن
Week 5	Phase Equilibrium, Two components system. Liquid-solid with (formation of eutectic mixture). Liquid-solid with (formation of compound with congruent melting point). Solutions/ ideal solutions التوازن الطوري, نظام مكونين, سائل-صلب (تكون المحلول اليوتيكتيكي). سائل صلب (تكون محلول بنقطة انصهار مدمجة). المحاليل المحاليل القياسية
Week 6	Solutions of gases in liquid (Henry's law). Liquid-liquid mixture (completely miscible) Raoult's law for ideal solution. Deviation from Raoult's law: Vapor pressure / composition diagram for: a) ideal solution. b) non-ideal solution with: 1.positive deviation 2.negative deviation. محاليل الغازات في السوائل (قانون هنري). خليط سائل-سائل (قابل للامتزاج التام) قانون راؤول للمثالي حل الانحراف عن قانون راؤول: ضغط البخار/مخطط التركيب ل: أ) الحل الأمثل. ب) الحل غير المثالي مع: 1. الانحراف الإيجابي 2. الانحراف السلبي.
Week 7	Mid-term Exam
Week 8	Solutions: Collective properties الخصائص الجمعية
Week 9	Gibbs free energy for two components solutions, 1. $\Delta G_{mix}$ for liquid mixture (ideal solution) 2. $\Delta G_{mix}$ for two liquids vapor(ideal gas) Thermodynamic for ideal solution $\Delta H_{mix}$ , $\Delta S_{mix}$ and $\Delta G_{mix}$ . طاقة جيبس الحرة لمحلول مكونين, 1 $\Delta G_{mix}$ . للخليط السائل (المحلول المثالي) 2 $\Delta G_{mix}$ . لسائلين بخار (غاز مثالي) تيرموديناميكي للمحلول المثالي $\Delta H_{mix}$ , $\Delta S_{mix}$ و $\Delta G_{mix}$ .
Week 10	Statistical thermodynamics: Statistical thermodynamics Boltzman relation الترموديناميك الاحصائي, علاقة يولترمان
Week 11	Partition function Q. Translation partition function. Rotational partition functions for diatomic molecule. دالة التقسيم
Week 12	Vibrational partition function , Degree of freedom دالة التقسيم التذبذبي, درجة الحرية

<b>Week 13</b>	Maxwell relations , thermodynamic calculations علاقات ماكسويل, حسابات الترموديناميك
<b>Week 14</b>	Relation between partition function and thermodynamic quantities. العلاقة بين دالة التقسيم والكميات الترموديناميكية
<b>Week 15</b>	Relation between and equilibrium constant $K_{eq}$ partition function $Q$ العلاقة بين ثابت التوازن ودالة التقسيم
<b>Week 16</b>	<b>final Exam</b> امتحان نهائي

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	Lab 1: Determination calorimeter constant مختبر 1: ايجاد ثابت المسعر
<b>Week 2</b>	Lab 2: Heat of Neutralization by Calorimetry, strong acid-strong base مختبر 2: حرارة التعادل المقاسة بواسطة المسعر حامض قوي- قاعدة قوية
<b>Week 3</b>	Lab 3: Heat of Neutralization by Calorimetry, weak acid-strong base مختبر 3: حرارة التعادل المقاسة بواسطة المسعر حامض قوي- قاعدة قوية
<b>Week 4</b>	Lab 4: Determination benzoic acid solubility over range of temperatures and calculation its heat of solution مختبر 4: ايجاد ذوبانية حامض البنزويك لمديات درجات حرارية مختلفة وحساب حرارة المحلول
<b>Week 5</b>	Lab 5: Determination heat of solubility for Potassium salt and calculation solution enthalpy مختبر 5: ايجاد حرارة الذوبان لملاح البوتاسيوم وحساب الانثالبي
<b>Week 6</b>	Lab 6: Determination Heat of Transition by Calorimeter مختبر 6: حساب حرارة التحول بواسطة المسعر
<b>Week 7</b>	Lab 7: Determination Heat of Vaporization by Calorimeter مختبر 7: حساب حرارة التبخر بواسطة المسعر
<b>Week 8</b>	Revision مراجعة
<b>Week 9</b>	Final exam الامتحان النهائي

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Physical chemistry, Peter Atkins	Yes
<b>Recommended Texts</b>	Thermodynamics, Statistical Thermodynamics, Thomas Engel	No
<b>Websites</b>	<a href="http://paginas.fisica.uson.mx/laura.yeomans/fiesta/lim.pdf">http://paginas.fisica.uson.mx/laura.yeomans/fiesta/lim.pdf</a>	

## Grading Scheme

### مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
<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>F – Fail</b>	راسب	(0-49)	Considerable amount of work required

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	<b>Physical Chemistry/course 2</b> الكيمياء الفيزيائية/الكورس الثاني		Module Delivery
			<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial
Administering Department	Department of Chemistry	College	College of Science
Module Leader	Saad Shahad Mohammed	e-mail	Saad.sh_chem@sci.utq.edu.iq
Module Leader's Acad. Title	Asst. Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	15/04/2024		

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	To enable students to evaluate the principles and applications of a physical chemistry and thermodynamic processes. فهم وتقييم مبادئ وتطبيقات الكيمياء الفيزيائية وعمليات الترموديناميك
Module Learning Outcomes	On completion of this module, students are expected to be able to: 1. Discuss the principles, applications and advantages of physical chemistry principles and techniques.

مخرجات التعلم للمادة الدراسية	<p>2. Perform chemical calculations and solutions for thermodynamic problems. r thermodynamic problems.</p> <p>عند اكمال هذا الكورس يتوقع من الطالب ان يكون قادرا على: 1- مناقشة مبادئ وتطبيقات وفوائد الكيمياء الفيزيائية وتقنياتها. 2- يستطيع الطالب ان يجري الحسابات الكيمياوية والحلول لمسائل الترموديناميك</p>
<p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>	<p>physical chemistry: gases, zeroth law, heat, work, thermodynamic, first law, enthalpy, internal energy, heat capacities, second law, entropy, gipps energy, chemical potential, third law of thermodynamic</p> <p>الكيمياء الفيزيائية: الغازات, القانون الصفري. الحرارة والشغل, الترموديناميك, القانون الاول للترمودينمك, الانثالبي, الطاقة الداخلية, السعة الحرارية, القانون الثاني للترموديناميك, الانتروبي, طاقة كبس الحرة, الطاقة الكامنة, القانون الثالث للترموديناميك</p>

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

<p><b>Strategies</b></p>	<p>The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p> <p>الاستراتيجية المتبعة في التعامل مع هذه المادة هي تشجيع الطلبة على المشاركة في التمارين. في نفس الوقت يتم تطوير قابلياتهم الذهنية وتفكيرهم الحاد والسريع في حل المسائل. هذا ممكن ان يكون خلال دروس المناقشة والمحاضرات التي تتضمن بعض الفعاليات البسيطة</p>
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### Delivery Plan (Weekly Syllabus)

## المنهاج الاسبوعي النظري

	Material Covered
Week 1	Gases: General introduction, gas properties and laws الغازات: مقدمة عامة، خواص الغاز وقوانينه
Week 2	Mixture of gases and Dalton law, Zeroth Law of Thermodynamics خليط الغازات وقانون دالتون، القانون الصفري للديناميكا الحرارية
Week 3	The First Law of Thermodynamic: Work, Heat, Internal Energy and Enthalpy + quiz القانون الأول للديناميكا الحرارية: الشغل والحرارة والطاقة الداخلية والمحتوى الحراري + اختبار
Week 4	Joule-Thomson Coefficients , Heat Capacities معاملات جول ثومسون، السعات الحرارية
Week 5	Enthalpy dependence on temperature, Adiabatic processes الاعتماد الحراري على درجة الحرارة، والعمليات الأديباتية
Week 6	Thermochemistry laws, enthalpy changes with temperature + quiz قوانين الكيمياء الحرارية، يتغير المحتوى الحراري مع درجة الحرارة + اختبار
Week 7	Mid-term Exam امتحان نصف الكورس
Week 8	Second Law of Thermodynamics, entropy القانون الثاني للديناميك الحرارية، الإنتروبي
Week 9	Entropy changes for phase transition, entropy changes with temperature تتغير الإنتروبي مع انتقال الطور، وتتغير الإنتروبي مع درجة الحرارة
Week 10	Carnot cycle and efficiency + quiz دورة كارنوت والكفاءة + اختبار
Week 11	Gipps free energy, Helmholtz energy طاقة جيبس الحرة، طاقة هيلمهولتز
Week 12	Fundamental equations for closed and open systems المعادلات الأساسية للأنظمة المغلقة والمفتوحة
Week 13	Maxwell relations , thermodynamic calculations علاقات ماكسويل، الحسابات الديناميكية الحرارية
Week 14	Chemical potential + quiz الإمكانات الطاقة الكيميائية الكامنة
Week 15	Third law of thermodynamic القانون الثالث للثرموديناميك



<b>Week 16</b>	<b>final Exam</b> الامتحان النهائي
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### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	Lab 1: Density of liquid as function of temperature
<b>Week 2</b>	Lab 2: Viscosity of liquid as function of temperature
<b>Week 3</b>	Lab 3: Determination radius of a Molecule from Viscosity Measurements
<b>Week 4</b>	Lab 4: Determination Heat of solution from solubility
<b>Week 5</b>	Lab 5: Determination molecular weight of a non-volatile material by freezing point depression
<b>Week 6</b>	Lab 6: Determination adsorption by adsorption isotherm
<b>Week 7</b>	Lab 7: Determination equilibrium Constant by the Distribution Method

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Physical chemistry, Peter Atkins	Yes
<b>Recommended Texts</b>	Thermodynamics, Statistical Thermodynamics, Thomas Engel	No
<b>Websites</b>	<a href="http://paginas.fisica.uson.mx/laura.yeomans/fiesta/lim.pdf">http://paginas.fisica.uson.mx/laura.yeomans/fiesta/lim.pdf</a>	

## Grading Scheme

### مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
<b>Success Group</b> <b>(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</b> <b>(0 – 49)</b>	<b>F – Fail</b>	راسب	(0-49)	Considerable amount of work required



<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>Analytical chemistry</b> الكيمياء التحليلية		<b>Module Delivery</b>
			<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab
<b>SWL (hr/sem)</b>	<b>200</b>		
<b>Module Level</b>	1	<b>Semester of Delivery</b>	1
<b>Administering Department</b>	Type Dept. Code	<b>College</b>	Type College Code
<b>Module Leader</b>	ساجدة صبار عفات	<b>e-mail</b>	E-mail
<b>Module Leader's Acad. Title</b>	Asst. Professor	<b>Module Leader's Qualification</b>	Ph.D.
<b>Module Tutor</b>	Name (if available)	<b>e-mail</b>	E-mail
<b>Peer Reviewer Name</b>	Name	<b>e-mail</b>	E-mail
<b>Scientific Committee Approval Date</b>	15/04/2024	<b>Version Number</b>	1.0

<b>Module Aims, Learning Outcomes and Indicative Contents</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. To develop problem solving skills and understanding of qualitative and quantitative chemical composition of substances</li> <li>2. To understand gravimetric analysis and basic principles.</li> <li>3. This course deals with the basic concept of gravimetric analysis.</li> <li>4. Precipitates properties required in gravimetric analysis</li> <li>5. Study of solubility and Factors affecting on solubility.</li> <li>6. To expand the student understands of the material and the student's continuous participation in solving some mathematical problems.</li> </ol>

<p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. Recognize on basic principles of gravimetric analysis</li> <li>2. Formation of Precipitates</li> <li>3. Identify the types Precipitates.</li> <li>4. Recognize on Solubility of Precipitates.</li> <li>5. Application of gravimetric analysis</li> <li>6. Calculation involving gravimetric analysis</li> <li>7. Define Ohm's law.</li> <li>8. Identify on factors affecting on solubility.</li> <li>9. Explain the activity Coefficients (The Debye-Huckel Equation).</li> </ol>
<p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <ul style="list-style-type: none"> <li>• <b>General idea of gravimetric analysis and basic principles, Classification of gravimetric analysis methods, dissolution method (volatilization), Precipitation methods. Precipitation steps, Gravimetric analysis calculations, Properties of products used in gravimetric analysis, gravimetric coefficient, and mathematical examples. Crystal composition precipitates, colloidal precipitates, crystalline precipitates, Mechanism of precipitate formation, nucleation, crystal growth, i.e. particle size and growth, and the Von-weimern equation, Residual contamination and its effect on the accuracy of the results. Contamination of precipitate, Simultaneous precipitation, Coprecipitation precipitation, post precipitation, Homogeneous and heterogeneous precipitation, Types of precipitators, organic precipitators, inorganic precipitators [15 hrs]</b></li> <li>• <b>Solubility, examples of solubility, The solubility product and applied examples, constant Factors affecting precipitates solubility, effect of common ion and applied examples, effect of pH of the solution and applied examples, effect of complex ion electrolyte concentration, effect of temperature, effect of solvent type, The speed of formation of the precipitate, precipitation degree and Precipitation factor and applied examples , ions separation, sulfides separation and applied examples, hydroxides separation and applied examples, Effect of electrolyte on solubility , ionic strength and applied examples, effect of complexion factor</b></li> </ul>

	<p>on solubility and applied examples, Activity Coefficients (The Debye-Huckel Equation) and applied examples, [15 hrs]</p> <ul style="list-style-type: none"> <li>• Continuous discussion within the lecture and asking some external questions to expand the understanding of the student the subject and the student's continuous participation in standing in front of the blackboard in solving some mathematical problems with giving some homework. [6 hrs]</li> </ul>

### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

<b>Strategies</b>	<p><b>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises solving, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, and by considering type of simple experiments involving some sampling activities that are interesting to the students.</b></p> <p><b>Teaching the student from the Internet unit to extract research and summary reports Practical paper. Continuous discussion inside the lecture, asking some external questions to expand the student's understanding of the material, and the student's continuous participation in standing in front of the blackboard in solving some mathematical problems. Ask questions in class and answer them and give assignments to solve mathematical problems. Conducting a quick exam at a specific time to see how quickly students respond and interact in class</b></p>
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### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	Material Covered
Week 1	General idea of gravimetric analysis and basic principles
Week 2	Precipitates properties required in gravimetric analysis

Week 3	Precipitates of formation
Week 4	Contamination Precipitates
Week 5	Solubility of Precipitates
Week 6	Factors affecting on solubility
Week 7	The Effect of Ionic Strength on solubility
Week 8	Activity Coefficients(The Debye-Huckel Equation)
Week 9	Monthly exam
Week 10	The Effect of complexes on solubility
Week 11	The Effect of pH on Solubility
Week 12	Precipitation degree and Precipitation factor
Week 13	Ionic Separation
Week 14	Sulfides Precipitation
Week 15	Hydroxides Precipitation
Week 16	Preparatory week before the final Exam

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Determination of crystalline water ratio in hydrated salt
Week 2	Lab 2: Determination of calcium as Ca - Oxalate
Week 3	Lab 3: Determination of iron as ferric oxide
Week 4	Lab 4: Determination of nickel as Dimethylglyoximate complex
Week 5	Lab 5: Determination of chloride as silver chloride
Week 6	Lab 6: Determination of sulphate as Barium sulphate

Week 7	Lab 7: Determination of Aluminum as Aluminum oxinate	
Week 8	Exam	
Week 9	Lab 8: Determination of zinc as zinc ammonium phosphate	
Week 10	Lab 9: Iron separated from the aluminum by precipitation	
Week 11	Lab 10: Barium separated from calcium by precipitation	
Week 12	Lab 11: Calcium separated from magnesium by perspiration	
Week 13	Lab 12: Separation of aluminum magnesium using Alaoxim as a precipitant	
Week 14	Lab 13: Iodine distribution between the organic solvent and aqueous solution	
Week 15	Final exam	

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamental of analytical chemistry by Skoog, • West, Holler & Crouch, 8 <sup>th</sup> and 9 <sup>th</sup> , 2004.	Yes
Recommended Texts	Analytical chemistry, seven edition, Gary D. Christian <i>University of Washington</i> , Purnendu K. (Sandy) Dasgupta <i>University of Texas at Arlington</i> , Kevin A. Schug <i>University of Texas at Arlington</i>	No
Websites		

### Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks (%)	Definition
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<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>F - Fail</b>	راسب	(0-49)	Considerable amount of work required

<b>Module Information</b> معلومات المادة الدراسية			
<b>Module Title</b>	<b>Analytical chemistry/2</b> الكيمياء التحليلية 2/		<b>Module Delivery</b>
<b>Module Type</b>			<input checked="" type="checkbox"/> Theory <input checked="" type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab
<b>Module Level</b>	1	<b>Semester of Delivery</b>	2
<b>Administering Department</b>	Type Dept. Code	<b>College</b>	Type College Code
<b>Module Leader</b>	ساجدة صبار عفات	<b>e-mail</b>	E-mail
<b>Module Leader's Acad. Title</b>	Asst. Professor	<b>Module Leader's Qualification</b>	Ph.D.
<b>Module Tutor</b>	Name (if available)	<b>e-mail</b>	E-mail
<b>Peer Reviewer Name</b>	Name	<b>e-mail</b>	E-mail
<b>Scientific Committee Approval Date</b>	01/06/2023	<b>Version Number</b>	1.0

<b>Module Aims, Learning Outcomes and Indicative Contents</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
<b>Module Aims</b> أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. To develop problem solving skills and understanding of separation methods.</li> <li>2. To understand Separation by distillation, basic principles and distillation types.</li> <li>3. This course deals with the basic concept of separation methods and their importance in analysis.</li> </ol>

	<ol style="list-style-type: none"> <li>4. Study of extraction efficiency, factors affecting extraction efficiency</li> <li>5. Study of extraction systems</li> <li>6. Study of equilibriums in extraction processes liquid-liquid and</li> <li>7. Extraction techniques</li> <li>8. Study of Chromatographic separation, chromatographic types and their importance in analysis.</li> <li>9. To expand the student understands of the material and the student's continuous participation in solving some mathematical problems.</li> </ol>
<p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. Recognize on basic principles of separation methods and their in analysis.</li> <li>2. Separation by distillation, basic principles and distillation types.</li> <li>3. Recognize on extraction systems.</li> <li>4. Application of extraction efficiency, and extraction percentage.</li> <li>5. Recognize on Extraction techniques</li> <li>6. Chromatographic separation</li> <li>7. Chromatographic types and their importance in analysis.</li> </ol>
<p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>	<p>Indicative content includes the following.</p> <p>A general idea of the methods of separation and their importance in the analysis and the errors resulting from the methods of separation, Separation by precipitations , basic principles, applied examples, Separation by distillation, basic principles, Distillation types, applied examples, Separation by extraction, mathematical laws of extraction, Extraction efficiency and applied examples, Factors affecting extraction efficiency, extraction percentage and applied examples . [12 hrs]</p> <p>The forces acting between the particles in the two phases, pH effect</p> <p>Effect of complex formation on extraction, Factors affecting complex formation upon extraction, Extraction systems, Equilibrium in liquid-liquid extraction, Separation techniques by extraction, Simple extraction, continuous extraction method, examples and applications, Separation by ion exchange, principles and basic requirements for ion exchangers, positive and negative exchangers, capacity of exchangers, balances of ion exchangers and factors affecting them. [12 hrs]</p> <p>Separation by chromatography, a general idea of chromatography, Classification of chromatographic methods, Thin layer chromatography, Paper chromatography, Ion exchange chromatography, Column chromatography, gas chromatography, High efficiency liquid chromatography [12 hrs]</p>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

Strategies	<p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, interactive tutorials and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p>
	<p>Type something like: The main strategy that will be adopted in delivering this module is to encourage students' participation in the exercises solving, while at the same time refining and expanding their critical thinking skills. This will be achieved through classes, and by considering type of simple experiments involving some sampling activities that are interesting to the students.</p>
	<p>Teaching the student from the Internet unit to extract research and summary reports Practical paper. Continuous discussion inside the lecture, asking some external questions to expand the student's understanding of the material, and the student's continuous participation in standing in front of the blackboard in solving some mathematical problems. Ask questions in class and answer them and give assignments to solve mathematical problems. Conducting a quick exam at a specific time to see how quickly students respond and interact in class</p>

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
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Week 1	General idea of separation methods and their importance in analysis
Week 2	Separation by distillation, basic principles
Week 3	Types of distillation
Week 4	Indirect separation techniques
Week 5	Separation by extraction
Week 6	Extraction efficiency, factors affecting extraction efficiency
Week 7	Extraction systems , The forces affecting between particles in the two phases, Solvent Extraction of Metals
Week 8	Monthly Exam
Week 9	Factors affecting complex formation upon extraction, Extraction of ion-association-complexes
Week 10	Equilibriums in extraction processes liquid-liquid
Week 11	Extraction techniques
Week 12	Chromatographic
Week 13	Paper Chromatographic and thin layer Chromatographic
Week 14	Colum Chromatographic and ion exchange Chromatographic
Week 15	High-performance liquid Chromatographic and gas Chromatographic
Week 16	Preparatory week before the final Exam

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Determination of magnesium as pyrophosphate
Week 2	Lab 2: Determination of lead as lead chromate
Week 3	Lab 3: Separation of some indicators by paper Chromatography
Week 4	Lab 4: Separation of some amino acids by paper Chromatography

Week 5	Lab 5: Separation of carbohydrates by Thin Layer Chromatography
Week 6	Lab 6: Separation of some fatty acids by Thin Layer Chromatography
Week 7	Lab 7: Iron and aluminum separating the packed cellulose column
Week 8	Exam
Week 9	Lab 8: Separation and determination of zinc and magnesium by ion exchange
Week 10	Lab 9: Separation of cobalt and nickel by anion exchange
Week 11	Lab 10: Separation of chloride from bromide by anion exchange
Week 12	Lab 11: Separation of ( copper – zinc – cobalt )
Week 13	Lab 12: Iron and aluminum separating the packed cellulose column
Week 14	Lab 13: Determination the amount of ions recovered
Week 15	Final exam

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Analytical chemistry, seven edition, Gary D. Christian <i>University of Washington, Purnendu K. (Sandy) Dasgupta</i> <i>University of Texas at Arlington, Kevin A. Schug</i> <i>University of Texas at Arlington</i>	NO
Recommended Texts	Analytical Techniques in the Sciences (AnTS) <i>Series Editor: David J. Ando, Consultant, Dartford, Kent, UK</i>	No
Websites		

### Grading Scheme

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