	Ministry of Higher Education and Scientific Research - Iraq Northern Technical University College of Oil & Gas Techniques Engineering/Kirkuk Department of Fuel and Energy Engineering	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	**Analytical chemistry**			**Module Delivery**	
Module Type	**Basic**			☒ **Theory** ☒ **Lab** ☒ **Tutorial** ☐ **Practical** ☒ **Seminar**	
Module Code	**FEK101**				
ECTS Credits	**7**				
SWL (hr/sem)	**175**				
Module Level	1		**Semester of Delivery**	1	
Administering Department	FEK		**College**	COGTEK	
Module Leader	**Dr. Najwa M.Latif**		**e-mail**	Najwa_alkarimi@ntu.edu.iq	
Module Leader's Acad. Title	Lecturer		**Module Leader's Qualification**	Ph.D.	
Module Tutor			**e-mail**	E-mail	
Peer Reviewer Name			**e-mail**	E-mail	
Scientific Committee Approval Date	01/06/2023		**Version Number**	1.0	

Relation with other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. To develop an understanding of the range and uses of analytical methods in chemistry. 2. To establish an appreciation of the role of chemistry in quantitative analysis 3. To develop an understanding of the broad role of the chemist in measurement and problem solving for analytical tasks. 4. To develop some understanding of the professional and safety responsibilities residing in working on chemical analysis.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Expresses the role of analytical chemistry in engineering fields. 2. Explains the fundamentals of analytical chemistry and steps of a characteristic analysis. 3. Providing the ability to design systems to meet the required needs in the field of fuel and energy engineering. 4. Introducing students to contemporary techniques, skills and equipment in the engineering field. 5. Using the latest teaching methods and allowing students to discuss and evaluating the student's intellectual curiosity and imagination. 6. Written and oral communication skills, initiative and sensitivity to the interests and views of others and ability to take directions. 7. Ability to cope with ambiguity, positive interaction with others, common sense and good judgement 8. Using the analytical lab to develop meaningful problem-solving skills and to demonstrate and have students participate in the entire analytical process.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following.

	Part A - Analytical Chemistry The Analytical Process, obtaining a representative sample, Handling and storing samples, Problems associated with obtaining gross samples, Preparing the sample for analysis, Performing necessary chemical separations, Instrumental techniques, Instrument Standardization. Part B- Stoichiometric calculations The basics: atomic, molecular, and formula weights, moles, concentrations of solutions, density calculations, dilutions, solid samples, liquid samples. Revision problems volumetric analysis- titration, classification of titration methods, volumetric calculations, standardization and titration calculations, precipitation and complexometric titration reactions, back-titration, titer. Revision problems Part C - Acid–base equilibria Acid–Base Equilibria in Water, The pH Scale, Weak Acids and Bases, Salts of Weak Acids and Bases, Buffers. Acid–base titrations, strong acid versus strong base, weak acid versus strong base, weak base versus strong acid, titrations without measuring volumes, Complexes and Formation, Detection of the End Point, Effect of Acidity on Solubility of Precipitates, Precipitation Titrations. Revision problem classes

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Explanation of the concept of Analytical Chemistry can be done using various relevant methods and strategies to make it easier for students to understand, for example through laboratory or practicum activities, using problem-based learning, or problems

	solving. In this case, the learning can be a combination of conceptual understanding, exercises, and problem teaching. Problems are an important feature of analytical chemistry as it helps in developing analytical thinking and serves to expand the field of interest, so the selection of problem sequences is an important aspect of increasing deductive and inductive reasoning.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	127	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	8
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	48	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Basic concept of qualitative and quantitative analysis
Week 2	Qualitative and quantitative analytical method and concentrations
Week 3	Qualitative and quantitative analytical method and concentrations
Week 4	Principals of quantitative gravimetric analysis
Week 5	Stoichiometric of chemical analysis
Week 6	Stoichiometric of chemical analysis
Week 7	Mid-term Exam
Week 8	Chemical equilibrium and Chemical solubility
Week 9	Reactions of acids, bases
Week 10	pH for the acidic solutions
Week 11	Buffer solution
Week 12	Leader diagram
Week 13	Equilibrium in the oxidation and reduction reactions, equations of oxidation and reduction, indicators of oxidation and reduction.
Week 14	Equilibrium in the precipitation, solubility, precipitation and partial precipitation.
Week 15	Drawing of reaction curves in aqueous solution, construction of titration curves of aqueous solutions
Week 16	**Preparatory week before the final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Preparation of solids
Week 2	Preparation of solution
Week 3	Standardization of HCl with a hydrous sodium carbonate
Week 4	Preparation and standardization of Acetic Acid with sodium hydroxide
Week 5	Determination of a mixture of sodium hydroxide and sodium carbonate
Week 6	Preparation and standardization of silver nitrate by Mohr's Method
Week 7	Mid-term Exam
Week 8	Determination of chloride ion by Mohr's Method
Week 9	Determination of chloride ion by Volhard Method
Week 10	Determination of Iron by potassium Dichromate
Week 11	Determination of water Hardness
Week 12	Analysis of soluble chloride by gravimetric method

Week 13	Analysis of iron solution by gravimetric Method
Week 14	Analysis of Nickel Oxide by gravimetric Method
Week 15	Final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	MAHIN, E. G. (1932). Quantitative Analysis ... Fourth Edition. United Kingdom: McGraw-Hill Book Company.	
Recommended Texts	Zumdahl, S. A., Zumdahl, S. S. (2014). Chemistry. United States: Cengage Learning.	
Websites	https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Analytical_Chemistry_2.1_(Harvey)	

Grading Scheme مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**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
Fail Group (0 – 49)	**FX –** Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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