MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information معلومات المادة الدراسية					
Module Title	Physical chemistry			**Module Delivery**	
Module Type	C			☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	UOMU0206032				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level	UGII		**Semester of Delivery**	3	
Administering Department	**Fuel and Energy Techniques Engineering Department**		**College**	**Engineering Technical College**	
Module Leader	**Shahad Ammar Hatem**		**e-mail**	shahd.ammar.hatem@uomus.edu.iq	
Module Leader's Acad. Title	**Assistant Lecturer**		**Module Leader's Qualification**	**Msc. Chemical Engineering**	
Module Tutor			**e-mail**		
Peer Reviewer Name			**e-mail**		
Scientific Committee Approval Date			**Version Number**		

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.Develops understanding l INTRODUCTION Physical chemistry, Classification of Matter, Properties of gases, gas law(Boyle's Law ,Charles' Law, Gay-Lussac's Law) Avogadro's Principle(2. Understanding the Combined Gas Law, ideal and real gases, The gas constant R , 3. To know the Covers first and second laws of thermodynamics 4. To know Applications of adsorption, Pressure difference across curved surfaces, Surface tension, and capillary rise. Langmuir adsorption isotherm . 5. Understanding Heat of Reaction, heat of Formation, Heat of Combustion, effect of temperature on Heat of Reaction,.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The student able to: 1. Understand the thermodynamic cycles and processes. 2. To know the main equation for closed and open systems. 3. Understand the meaning thermodynamics, perfect gas law. 4. Understand the properties of real gases, and the general energy. 5. Enable students to obtain knowledge and understanding of the principles of gas laws 6. Enabling students to obtain knowledge and understanding of the laws of thermodynamics 7. Enabling students to obtain knowledge and understanding of the 8. relationship between laws 9. Enabling students to acquire knowledge of the methods of deriving the basic 10- Enable students to identify the most important applications of Thermodynamics
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Introduction to gas law. 2. Introduction to thermodynamic. 3. main equation for closed and open systems. 4. identify the most important applications of 5. acquire knowledge of the methods of deriving the basic equations of thermodynamics, Ideal and real gases

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Assessment is based on hand-in assignments, written exam, Quizzes, reports, seminars, Practical testing and Online testing.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	78	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	180		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	5	10% (10)		
	Assignments	2	10% (10)		
	Projects	1	10% (10)		
	Report/ Lab.	10	10% (10)		
Summative assessment	**Midterm Exam**		10% (10)		
	Final Exam	4 hr	50% (50)		
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Revision to General INTRODUCTION Physical chemistry, Classification of Matter, Properties of gases, gas law(Boyle's Law ,Charles' Law, Gay-Lussac's Law) Avogadro's Principle)
Week 2	Combined Gas Law, ideal and real gases, The gas constant R (8.314 J / mol·K, 0.0821 L • atm/ mol • K, R = 1.9872 Cal / mol.) ,
Week 3	van-der Waals equation of state ,Dalton's Law of Partial Pressures, Questions and solutions.
Week 4	Relationship between density and molecular weight of gas , Diffusion of gases (Graham's law)
Week 5	Change of State: One component systems: Vapor pressure and external pressure, Liquid-vapor composition diagram, Liquid-Liquid binary mixture, Roulette's law for ideal mixtures, Non-ideal Liquid mixtures, The principle of distillation, Henry's law, solubility of gases in Liquids
Week 6	Thermodynamics: First law of Thermodynamics, Enthalpy, reversible changes, maximum work. Heat capacities at constant pressure and volume, adiabatic changes
Week 7	. Heat of Reaction, heat of Formation, Heat of Combustion, effect of temperature on Heat of Reaction,Questions and solutions
Week 8	Second and Third Laws of Thermodynamics, spontaneous processes, Entropy change for an ideal gas and accompanying phase change, Gibb's Free Energy, Questions and solutions
Week 9	Heats of Reactions: Heats of Formation, Temperature dependence of the heat of reaction,
Week 10	Reversible reactions, Thermodynamic equilibrium constant, Extent of Reaction.
Week 11	Electrochemistry: Laws of Electrolysis and their applications. Difference between Galvanic and Electrolytic cells, electrode reactions, polarized electrode, Decomposition potential, Over voltage. Galvanic cells, Free Energy changes in cells, Reversible electrode potentials, Single electrode potential and its determination. Nernst Equation and its derivation. EMF series. Primary and Secondary galvanic cells, Fuel Cells and applications.

Week 12	Surface Chemistry: Determination of size and shape, Colloids (Classification and preparation, Structure and stability, The electrical double layer),
Week 13	Surface Chemistry: Determination of size and shape, Colloids (Classification and preparation, Structure and stability, The electrical double layer),
Week 14	Adsorption: Applications of adsorption, Pressure difference across curved surfaces, Surface tension, and capillary rise. Langmuir adsorption isotherm. Freundlich adsorption isotherm, adsorption isotherm. Surface , Questions and answers to review all the subject ,
Week 15	**Final exam**

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Safety in laboratory, laboratory tool , How to write a scientific report
Week 2,3	Measurement of the density by pycnometer and hydrometer
Week 4,5	Extraction of heavy oils from water
Week 6,7	measurement Surface tension
Week 8.	measurement refractive index
Week 9	Viscosity measurement
Week 10.11	Find the calorimeter constant
Week 11,12	the molecular weight of a volatile liquid using the Dumas method
Week 13	solubility
Week14	Preparatory week before the final Exam
Week15	final Exam

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Physical chemistry/ 4th edition/ Houghton Mifflin Co. / N.Y. / 2003	yes
Recommended Texts	Physical Chemistry/ P.W.Atkins/ 9th edition / Oxford university press/ 2009	no
Websites	https://chem.libretexts.org/Special:FirstLogin Welcome?return=	

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.