

MODULE DESCRIPTION FORM

Module Information					
Module Title	General Chemistry I		Module Delivery		
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code					
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level		1 (Undergraduate)	Semester of Delivery		1
Administering Department		Type Dept. Code Department of Environmental Technologies	College	Type College Code College of Environmental Science and Technologies	
Module Leader	Dr.Eman A.M. Al-jawadi		e-mail	emanaljawadi@uomosul.edu.iq	
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification		Ph.D./Chemistry Science
Module Tutor	Mohammed Saadallah Younus Lena nofel mohammed salih Mustafa Amer Dhannoon Lab . Abeer Saleh Atiya		e-mail		
Peer Reviewer Name		Name	e-mail	E-mail	
Scientific Committee Approval Date			Version Number		

Relation with other Modules

Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	To students; to provide the necessary knowledge accumulation in professional fields by comprehending basic chemistry subjects, to give knowledge of chemistry and the ability to apply concepts to the solution of chemistry problems.
Module Learning Outcomes	To be able to follow developments in chemistry fields such as environment, pharmaceuticals, food, polymers, paint, and health and solve the basic problems in research and development laboratories related to these fields
Indicative Contents	SKILLS Ability to apply theoretical and practical knowledge of chemistry to advanced studies in the chemical industry Ability to apply occupational safety principles to ensure the safe use and disposal of chemicals and keep their global environmental impact at minimum level To be able to adapt to the rapidly developing technological environment with the awareness of lifelong learning and follow the developments in science and technology To be able to follow developments in chemistry fields such as environment, pharmaceuticals, food, polymers, paint, and health and solve the basic problems in research and development laboratories related to these fields

Learning and Teaching Strategies

Strategies	Strategies of Teaching is knowing principles of chemical and methods and apparatus used .

Student Workload (SWL)			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	108	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7.2 (108/15)
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	67	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.46 (67/15)
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)	4,6,8,12,15	LO #1 -3,4-5,6-7,19-12and 13-14
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Tutorial	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	9	LO # 1-8
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Module Name	SSWL(hr/W)						Exam (hr/Sem)	SSWL (hr/Sem)	USSWL (hr/Sem)	SWL (hr/Sem)	ECTS
	CL (hr/W)	Lect (hr/W)	Lab (hr/W)	Pr (hr/W)	Tur (hr/W)	SEM (hr/W)					
General Chemistry I 1 st Class	3	1	2		1		3	108	67	175	7
	45 (3/15)	15 (1/15)	30 (2/15)		15 (1/15)		3				

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
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Week 1	General Introduction, Chemical Bonds and Molecular Structures
Week 2	Periodic Relationships Among the Elements, Atomic and Molecular Orbitals, Hybridizations
Week 3	Chemical Bonding II: Molecular Geometry and Hybridization
Week 4	Functional Groups, Intermolecular Forces.quiz
Week 5	An Introduction to Organic Reactions and Their Mechanism, Nomenclature and Conformation of Alkanes / Cycloalkanes
Week 6	Nucleophilic Substitution Reactions of Alkyl Halides .quiz
Week 7	Properties and Synthesis of Alkenes and Alkynes
Week 8	Aromatic Compounds , Rezonance Theory. quiz
Week 9	Mid-term Exam
Week 10	General properties of solutions
Week 11	Concentration.. Ideal, diluted or concentrated solutions.
Week 12	Solubility. Solutions of electrolytes .quiz
Week 13	. Changes of state in liquid solutions
Week 14	Osmosis. Colligative properties and determination of molecular weight.
Week 15	Colloidal systems:Hydrophilic and hydrophobic colloidal systems.: micelles and bilayers. quiz
Week 16	final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Qualitative analysis of cations

Week 2	Melting point
Week 3	boiling point
Week 4	simple distillation
Week 5	Fractional distillation
Week 6	Sublimation
Week 7	Recrystallization
Week 8	Purification of NaCl
Week 9	Determination of Fe +3 and Fe+2
Week 10	Purification of NaCl & KCl
Week 11	Complex preparation
Week 12	Preparation of methane gas
Week 13	Acetylene preparation
Week 14	Identification of double and triple bond (in unsaturated compounds)...1
Week 15	Identification of double and triple bond (in unsaturated compounds)...2

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Chemistry, 13th Edition, Raymond Chang & Jason Overby	
Recommended Texts	General Chemistry: Principles and Modern Applications, 11th Edition, Ralph H. Petrucci, F. Geoffrey Herring, Jeffry D. Madura, Carey Bissonnette	
Websites		

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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



MODULE DESCRIPTION FORM

Module Information			
Module Title	General Biology		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☒ Seminar
Module Code	UoM		
ECTS Credits	7		
SWL (hr/sem)	175		
Module Level	UG1	Semester of Delivery	1
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Shaymaa Khaleel Abdullah Mayada Ahmed AL-Taii	e-mail	drshaymaakhleel@uomosul.edu.iq maysbio55@uomosul.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Diana Nooraldine Mustafa Abdullah Abdusttar Thanoon	e-mail	Dyasbio86@uomosul.edu.iq abdullah84@uomosul.edu.iq
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date		Version Number	1.0

Relation with other Modules			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	
Module Aims, Learning Outcomes and Indicative Contents			
Module Aims	1- The study of general biology aims to introduce the student to the groups of living organisms and the nature of their structural parts. 2- Studying the multiple cellular structures according to the type of organism. 3- Knowing how they spread and distribute in the surrounding environment and their interaction with it.		
Module Learning Outcomes	1- Learn about biology, its branches, and its importance to humans and the environment 2- Distinguish different cell shapes and their diversity according to the type of organism. 3-Studying the chemical nature of cellular components. 4- Understanding the difference between eukaryotic and prokaryotic organisms. 5- Studying the process of cell division and growth 6- identify the mechanism of formation the reproductive structures in higher organisms. 7-Knowing the basics of classification and scientific naming of eukaryotic organisms. 8-Distinguishing the phylum's and families of the animal and plant kingdoms . 9-Clarifying the different feeding methods in animals and the process of energy		

	production and metabolism. 10-Explain the nutritional metabolic activities in plants. 11- Studying the nature of the relationship between species of organisms and their surrounding environment.
Indicative Contents	Indicative content includes the following: Introduction - to biology, its branches and importance. - General instructions (7h) The cell: its discovery and structure - non-living cellular components - the nucleus and cellular organelles - the microscope and its components - estimation of the dimensions of cells and organelles - plant cells - animal cells (21h). Forms of living cells - animal and plant - cell types, plant and animal - meristematic tissues + parenchyma + sclerenchyma - epidermis + wood + bark + vascular tissues - practical exam (9h) Cell Division - Mitosis and Reduction - Mitosis Lab (6h) review (4h) midterm exam (1h) Reproduction and growth in animals - Reproduction and growth in plants (10h) Classification and Scientific Nomenclature - People of the Plant Kingdom - People of the Animal Kingdom - Protozoa (Amoebae + Paramecium) - Sponges and Hydra - Worms and Insects - Animal Tissues (25h) Nutrition and photosynthesis in plants - for feeding, digestion and metabolism in animals (10h) Environment and its effect on the distribution of animals and plants (5) review (4h) final exam(3h)

Learning and Teaching Strategies

Strategies	The main strategy that will be adopted in presenting this course is to encourage students to read and discuss, and to provide the student with the skill of scientific observation and description of the phenomenon, while improving their critical thinking skills at the same time. This will be achieved through daily and quarterly examinations, daily discussions, and through hands-on observations in laboratory experiments that include some sampling activities and examination of specimens and microscopic slides of the subject.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (hr./sem.)	108	Structured SWL (hr./w)	7.2
Unstructured SWL (hr./sem.)	67	Unstructured SWL (hr./w)	4.5
Total SWL (hr./sem.)	175		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	10% (10)	Lab. 7, 14 Lec. 5, 13	LO # 2-5 and 7-9 LO # 1,2,3 and 6,7
	Assignments	1	10% (10)	5	LO # 4
	Projects / Lab.	1	10% (10)	Continuous	All

	Report	1	10% (10)		
Summative assessment	Midterm Exam	1 hr.	10% (10)	7	LO # 1-5
	Final Exam	3hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Biology
Week 2	The Cell: discovery and structure
Week 3	The Cell : Non-living cellular components
Week 4	The Cell : the Nucleus and Cellular organelles
Week 5	Shape of the Cell : Plant and Animal Cells and quiz 1
Week 6	The Cellular Divisionmitosis
Week 7	The cell division : meiosis and Mid-term Exam
Week 8	Growth and Reproduction in animals
Week 9	Growth and Reproduction in Plants
Week 10	Classification and Nomenclature
Week 11	The Animal Kingdom
Week 12	The Plant Kingdom
Week 13	Nutrition , Digestion and Metabolism in Animals and quiz 2

Week 14	Nutrition and photosynthesis in plants
Week 15	Environment and its influence on the distribution of fauna and flora
Week 16	The final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	General Instructions
Week 2	Microscope and its components
Week 3	Estimating the dimensions of cells and organelles
Week 4	Cell division
Week 5	Meristemic tissue + parenchyma + sclerenchyma
Week 6	Epidermis + xylem + bark + vascular tissue
Week 7	Part 1 exam
Week 8	Cells : plant and animal types
Week 9	Protozoa: amoeba + paramecium
Week 10	Sponges and Hydra
Week 11	Worms and insects
Week 12	Starfish and arthropod
Week 13	Animal tissue
Week 14	Part 2 exam
Week 15	final exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	علم الاحياء ج 1 ، ج 2 . لجنة من وزارة التعليم العالي والبحث العلمي	
Recommended Texts	Jeff Hardin, Gregory Paul Bertoni, Lewis J. Kleinsmith - Becker's World of the Cell (8th Edition) (2011, Benjamin Cummings). Sylvia Mader, Michael Windelspecht - Essentials of Biology (2017, McGraw-Hill). Jain,Dk., Singh, V., Pande, Pc. (2018).Textbook of Botany.Fifth Ed.,India.	No
Websites		

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	MATHEMATICS I		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☒ Seminar
Module Code			
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	Bachelor's Degree	Semester of Delivery	1
Administering Department	Environmental Tech.	College	Environmental Science and Technology
Module Leader	Marwan Jameel	e-mail	marwan.jameel@uomosul.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. The aim of this course is to give an introductory course on basics concepts of analysis, to teach limit, derivative, integral concepts and their applications. 2. To develop problem solving skills and understanding of calculus theories through the application of techniques.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Define basic functions, take the limit of functions and investigate their continuity, 2. Take the derivatives of functions, using derivative a student can sketch and interpret the graph of functions, 3. Solve maximum and minimum problems, 4. Classify integrals, use techniques of integration, 5. Define and classify improper integrals, 6. Apply derivative and integral concepts to his/her profession. 7. Define sequences, analyze the convergence of sequences, can recognize series and use convergence tests for series, can find Taylor and Maclaurin series expansion of given functions.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Functions general overview, Limit and continuity, limits involving infinity, asymptotes. [15 hrs] Derivative and its applications-Chain rule, Mean Value theorem, Rolle's theorem. [15 hrs] Curve sketching-Concavity, concave up, concave down, Maximum and minimum problems, Sequences and series-convergence and divergence [15 hrs] Introduction to integration, Definite integrals and fundamental theorem of calculus [15 hrs] Techniques of integration- Integration by parts, trigonometric integrals, integration of

	Rational functions, Improper integrals and Applications of integration. [20 hrs] Sequences and series-convergence and divergence, Convergence tests for series-Integral test, comparison test, the root and ratio test, Alternating series, Taylor and Maclaurin series.[10]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Activities are given in detail in the section of "Assessment Methods and Criteria" and "Workload Calculation" 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 in order to introducing the basic topics of analysis, to teach the concepts of limit, derivative, integration and their applications.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا
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Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation					
تقييم المادة الدراسية					
		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	4, 12	LO #1, 2, 10 and 11
	Assignments	All	10% (10)	Per week	All
	Attendance	All	10% (10)	Per week	All
	Projects / Lab.	1	5% (5)	Continuous	All
	Report and seminar	1	5% (5)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hrs.	20% (20)	7	LO # 1-7
	Final Exam	2 hrs.	40% (40)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered

Week 1	Functions general overview
Week 2	Limit and continuity, limits involving infinity, asymptotes
Week 3	Derivative and its applications-
Week 4	Chain rule, Mean Value theorem, Rolle's theorem
Week 5	Curve sketching-Concavity, concave up, concave down
Week 6	Midterm exam, Maximum and minimum problems
Week 7	Introduction to integration
Week 8	Definite integrals and fundamental theorem of calculus
Week 9	Techniques of integration
Week 10	Integration by parts, trigonometric integrals
Week 11	Midterm exam
Week 12	integration of Rational functions
Week 13	Improper integrals and Applications of integration
Week 14	Sequences and series-convergence and divergence
Week 15	Taylor and Maclaurin series
Week 16	Final exam

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?

Required Texts	Thomas, Calculus and Analytic Geometry, Addison-Wesley 1996.	Yes
Recommended Texts	Silverman R.A, Calculus with analytic geometry, Prentice-Hall Inc. 1985. Adams, R.A, Calculus, a complete course, Addison-Wesley 2003.	No
Websites	https://www.youtube.com/playlist?list=PLF797E961509B4EB5	

Grading Scheme مخطط الدرجات				
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	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.				

MODULE DESCRIPTION FORM

Module Information				
Module Title	Physics		Module Delivery	
Module Type	basic		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code				
ECTS Credits	7			
SWL (hr/sem)	175			
Module Level	1	Semester of Delivery	1	
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	Ali Basheer		e-mail	E-mail
Module Leader's Acad. Title	teacher		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Rihab Raad Hamsa Burhan		e-mail	Rihab@uomosul.edu.iq hamsaalbazaz@uomosul.edu.iq
Scientific Committee Approval Date	01/06/2023	Version Number	1.0	

Relation with other Modules			
Relationship with other subjects			
Prerequisite module	None	Semester	
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. to Develop the student's skills and ability to understand the basic principles of classical physics and to reach and formulate physical laws 2. Enriching the student with various topics in physics such as mechanics and its topics (vectors, physical quantities, types of motion, Newton's laws and fluids), thermodynamics and its contents of topics such as (thermal equilibrium, general law of gases, etc.) in addition to electrical physics and the topics it contains related to current, voltages, resistors and types of connecting resistors in electrical circuits. 3. Helping and developing the student's abilities to solve mathematical problems related to the above topics. 4. The study contains the practical part, which includes a set of experiments that are conducted in the laboratory as a practical application of some of the topics that have been given to the student in the theoretical part.
Module Learning Outcomes	1. Identify the concept of vectors, vector and non-vector quantities, operations on vectors and their applications. 2. Know the difference between linear and rotational motion and identify Newton's laws of motion and types of energy. 3. Identify the concept of torque, harmonic movement and projectile movement. 4. Learn about thermodynamics, temperature scales and heat transfer methods. 5. Identify the properties of gases, the general law of gases and the concept of heat capacity. 6. Identify some concepts of fluid science such as fluid properties such as surface tension, capillary tubes, cohesion and adhesion forces. 7. Identify some concepts of electrical physics such as current, voltages, resistance and types of connecting resistors in electrical circuits. 8. Learn how to conduct some experiments and know their laws

Indicative Contents	Basic concepts of vectors/physical quantities, units and symbols, vector magnitude, vector units of axes, vector algebra, numerical product, vector product, some vector applications, force moment, vector representation, vector analysis, definitions of vector quantity and non-vector quantity - solving questions. [11h] Mechanics, velocity vector, acceleration vector, linear motion, laws of linear motion, circular motion, rotational motion, Newton's laws of motion, Newton's first law, mass and force, Newton's second and third laws, position functional force, concept of potential energy and kinetic energy, linear momentum, vertical motion, The work, force and force types. [12h] Torque - radial angle - double torque, harmonic motion - harmonic oscillator, motion on a curve - simple pendulum - motion of a restricted body, motion of projectiles - force analysis - question solving. [7h] Thermodynamics-Heat and Temperature-Thermal Equilibrium, Zero Law of Thermodynamics-Heat Capacity-First Law of Thermodynamics, Thermometers Thermocouples-Thermodynamic Processes, Work, Heat Transfer, Black Body Radiation. [12 h] Kinetic energy theory of gases, general properties of gases, ideal gas, general gas law, Boyle's law, Charles' law, applications of Charles' law, heat capacity of gases, specific heat capacity, molar heat capacity [12h] Fluid mechanics, definition and classification of fluids, shear stress, properties of fluid particles, dynamic movement, surface tension force, cohesion force, adhesion force, capillary tubes - calculating the height of the fluid inside the capillary tube. [17h] Ohm's law, specific conductivity, current density, resistance, specific resistance, connecting resistors, electromotive force, metallic conductivity, solving questions. [10 hours] Identifying the practical part of the material in the laboratory by conducting a set of experiments, some of which are related to the topics of the theoretical part, and proving its laws in practice. [24h]

Learning and Teaching Strategies

Strategies	The main strategy that will be adopted in delivering this module is to encourage students to participate in solving exercises, while improving and expanding thinking skills at the same time. This will be achieved through interactive classes and tutorials and through some experiments that include the practical application of what has been studied in the semester.
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Student Workload (SWL)			
Structured SWL (h/sem)	108	Structured SWL (h/w)	7
Unstructured SWL (h/sem)	67	Unstructured SWL (h/w)	4
Total SWL (h/sem)	175		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	15% (15)	3, 8,12,15	LO #1, 3, 6 and 7
	Assignments	4	10% (10)	3, 8,12,15	LO # 1, 3, 6 and 7
	Projects / Lab.				
	Report	1	15% (15)	Continuous	LO # 8
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1,2,3,8
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
week 1	Basic concepts of physical vectors/quantities, units and symbols, vector magnitude - vector units of axes - vector algebra
week 2	Numerical Product-Cross Product-Some Vector Applications, Momentum of Force -Vector Representation-Product Analysis
week 3	Definitions of Vector and Non-vector Quantum – Solving Questions
week 4	Mechanics - Velocity vector - acceleration vector - Linear motion - Laws of Linear Motion- Circular motion - rotational motion
week 5	Newton's laws of motion - Newton's first law - mass and force - Newton's second and third laws - Torque – Radial Angle – Dual Torque,
week 6	Position Function Force - Concept of Potential Energy and Kinetic Energy - Linear Momentum, Vertical Motion –The Work - Force and Types of Force
week 7	Midterm Exam
week 8	Harmonic Motion -Motion on a curve - simple pendulum - movement of a restricted body - motion of projectiles - force analysis - solving questions
week 9	Thermodynamics - Heat and Temperature - Thermal Equilibrium, Zero Law of Thermodynamic - Heat Capacity - First Law of Thermodynamic - Work - Heat Transfer - Black Body Radiation
week 10	Kinetic energy theory of gases - general properties of gases - ideal gas - general law of gases - Boyle's law - Charles law - applications of Charles' law
week 11	Heat Capacity of Gases - Specific Heat Capacity - Molar Heat Capacity - Fluid Mechanics - Definition and Classification of Fluids - Shear Stress
week 12	Properties of fluid molecules - dynamic motion - surface tensile strength, cohesion strength - adhesion force - capillary tubes - calculation of fluid height inside capillary tube
week 13	Ohm's Law – Specific Conduction – Current Density
week 14	Resistance-Specific Resistance-Connecting Resistors
Week 15	Electromotive Force - Metal Conductivity - Solving Questions
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Lab 1: An introductory lecture on how to write reports and explain the chart
Week 2	Lab 2: Simple Pendulum
Week 3	Lab 3: proof of Hook's law
Week 4	Lab 4: use a helical spring to determine the value of ground acceleration and find the equivalent mass of a helical spring
Week 5	Lab 5: Coefficient of static friction
Week 6	Lab 6: Prism refractive index
Week 7	Lab 7: Refractive index of glass block
Week 8	Lab 8: The focal length of a convex lens
Week 9	Lab 9: Speed of sound using a one-ended closed resonant tube
Week 10	Lab 10: Ohm's law
Week 11	Lab 11: find the viscosity coefficient of a liquid
Week 12	Lab 12: Archimedes base

Learning and Teaching Resources

	Text	Available in the Library?
Required Texts	-Physics for students of medicine and biology / General Physics for students of the Faculty of Agriculture and Forestry / Dr. Shaker Jaber	Yes

Recommended Texts	-Concepts in modern physics/ Dr. Moneim Mashkour and Mr. Shaker Jaber -Physics for students of geology / Dr. Farouk Ubaid - Mechanics for the students of science and engineering / Dr. Taleb Naji - Practical physics in units / E Armtiage - translated by Dr. Edmond Tobia George	No
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Grading Scheme				
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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	English Language 1		Module Delivery	
Module Type	B		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	UOM1021			
ECTS Credits	2			
SWL (hr/sem)	50			
Module Level	1	Semester of Delivery	1	
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	Wissam Saeed		e-mail	
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	M.A.	
Module Tutor	Name (if available)	e-mail	E-mail	
Peer Reviewer Name	Name	e-mail	E-mail	
Scientific Committee Approval Date	01/06/2023	Version Number	1.0	

Relation with other Modules			
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 support the highest degree of academic achievement by students who are not native speakers of English. 2. To improve basic English skills. 3. To determine how words function in a sentence. 4. To encourage students to express themselves in English. 5. To understand negatives and questions in English. 6. This course introduces the principles of academic writing.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Identify the main parts of speech in English. 2. Explain English pronouns and how to use them. 3. Illustrate English adjectives and adverbs. 4. Explain English prepositions 5. Discuss conversation skills and encouraging students to participate in a dialogue. 6. Improve the pronunciation skills of students. 7. Introduce the main functions of English grammar. 8. Describe verb to be. 9. Illustrate English present simple tense. 10. Discuss regular and irregular verbs. 11. Describe English past simple tense. 12. Identify Negatives and Question words. 13. Discuss present continuous tense. 14. Explain requests and offers. 15. Have knowledge of Environmental Terminology

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A- Parts of speech: Introduction - Pronouns (definition, types, and use of pronouns) - Adjectives(definition, types, and use of adjectives) – Adverbs (definition, types, and use of adverbs) – Prepositions (definition, types, and use of prepositions) [14 hrs] Part B- Conversation skills: Encouraging students to express themselves in English – to talk about science using English – improvement of pronunciation skills [4 hrs] Revision problem classes [2 hrs] Part C- English grammar: 1. Introduction - Verb to be – Present continuous tense -Negatives – Questions- Present simple tense –Question words –Present perfect tense- Regular and irregular verbs - Environmental Terminology – [22 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Some effective strategies will be adopted in delivering this module such as, focusing on academic language, vocabulary exercises. Students will be given an opportunity to produce language through reading and speaking with receiving direct feedback to increase their comprehension and improve their language skills. This will be achieved through classes, group discussion, solving exercises, participation in conversations, interactive learning and writing activities that are interesting to the students.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	10% (10)	5, 10	LO # 1, 2, 3, 6, 8, 9, 10, and 13
	Online Assignments	1	10% (10)	2, 7, 12	LO # 2, 4, 5, 10, 11, 12, 13 and 14
	Onsite Assignments	1	10% (10)	2, 7, 12	LO # 2, 4, 5, 10, 11, 12, 13 and 14
	Projects / Lab.	0	0% (0)		
	Report	1	10% (10)	13	LO # 1, 6 and 12
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Improve the pronunciation skills of students.
Week 2	Identify the main parts of speech in English.
Week 3	Explain English pronouns and prepositions.
Week 4	Illustrate English adjectives.
Week 5	Illustrate English adverbs.
Week 6	Discuss conversation skills and encouraging students to participate in a dialogue.
Week 7	Mid-term Exam
Week 8	Introduce the main functions of English grammar.
Week 9	Describe verb to be.
Week 10	Illustrate English present simple tense.
Week 11	Discuss regular and irregular verbs.
Week 12	Describe English present perfect tense.
Week 13	Identify Negatives and Question words.
Week 14	Discuss present continuous tense.
Week 15	Environmental Terminology
Week 16	The final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Liz and John Soars, 2010, Headway, Oxford University Press.	No
Recommended Texts	English Grammar in Use, Raymond Murphy , 2nd edition, Cambridge University Press.	No
Websites		

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Geology		Module Delivery	
Module Type			☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code				
ECTS Credits	8			
SWL (hr/sem)	200			
Module Level	1	Semester of Delivery		2
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	Dr. Hazim Jumaa Mahmood		e-mail	hazimjm@uomosul.edu.iq
Module Leader's Acad. Title	lecturer		Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)		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	
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Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	1. Develop the ability to identify and interpret Earth materials, processes and features. 2. Understand how geoscientists investigate Earth systems. 3. Understand how geoscientists investigate Earth systems. 4. Describe the Earth's internal layered structure, its composition and properties, and the methods used to study it; identify the internal processes that affect the lithosphere and plate tectonics. 5. Distinguish between elements, minerals, and rocks; define the properties of a mineral and recognize the importance of minerals as natural resources and in identifying rocks. 6. Classify and distinguish between igneous, sedimentary, and metamorphic rocks and describe how they are formed by internal and surface processes on the Earth and on other planets. 7. describe the processes and effects of physical and chemical weathering
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain the basic divisions of the earth, their compositions. 2. Describe Earth's major systems and explain how they interact. 3. Identify common rocks and minerals and interpret how they form. 4. demonstrate an understanding of the origin and development of the Earth 5. demonstrate your knowledge of the various components of the Earth system 6. demonstrate your knowledge of the role of minerals in formation of the different types of rock 7. explain the rock cycle in terms of the Earth system processes 8. identify common rocks and minerals and interpret how they form 9. Identify minerals and rocks and recognize their importance in everyday life.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction, the earth and the Solar System, Earth's outer and inner spheres. [15 hrs]

	Cosmic abundance and origin of the chemical elements, Atoms, Elements, Isotopes, Ions, and Compounds. [10 hrs] Crystallography, Minerals and Mineral Groups. [23hrs] Igneous Rocks, weathering processes, Sedimentation and Sedimentary Rocks, Metamorphic Rocks. [34hrs] Soil and Soil formation. [5hrs] Historical geology and Geologic time scale. [10 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	This course will be delivered through a combination of lectures, discussions, and lab. The key strategy for presenting this subject will be to stimulate student participation while also polishing and strengthening their critical thinking skills. Student learning will be assessed through graded laboratory tests and examinations covering lecture content and through practical quizzes on lab works.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	109	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	91	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	200		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	15% (15)	4, 11	LO #1, 2, 3, 5 and 6
	Assignments				
	Lab.	4	20% (20)	2,4,6,10	4,5
	Report	1	5% (5)	13	LO # 5-9
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Geology
Week 2	The earth and the Solar System
Week 3	Earth's outer and inner spheres
Week 4	Cosmic abundance and origin of the chemical elements + Quiz
Week 5	Atoms, Elements, Isotopes, Ions, and Compounds

Week 6	Crystallography
Week 7	Mid-term Exam
Week 8	minerals
Week 9	Mineral Groups
Week 10	Igneous Rocks
Week 11	weathering processes + Quiz
Week 12	Sedimentation and Sedimentary Rocks
Week 13	Metamorphic Rocks
Week 14	Soil and Soil formation
Week 15	Historical geology and Geologic time scale
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Crystallography 1
Week 2	Lab 2: Crystallography 2
Week 3	Lab 3: minerals 1
Week 4	Lab 4: minerals 2
Week 5	Lab 5: Igneous Rocks 1
Week 6	Lab 6: Igneous Rocks 2

Week 7	Lab 7: Sedimentary Rocks 1
Week 8	Lab 8: Sedimentary Rocks 2
Week 7	Lab 9: Metamorphic Rocks 1
Week 10	Lab 10: Metamorphic Rocks 2
Week 11	Lab 11: Historical geology

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Physical Geology – 2nd Edition (2015), Steven Earle. Physical Geology, (2005), Abdul Hadi Y. Al-Sayegh and Farouk Al-Omari.	
Recommended Texts	An Introduction to Geology (2017), Chris Johnson, et al	
Websites		

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	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Computer science		Module Delivery
Module Type	Basic		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	UOM13211		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester of Delivery	1
Administering Department	Environmental Technology	College	environmental science and technology
Module Leader	Muthaina . A. Mustafa	e-mail	Muthaina@uomosul.edu.iq
Module Leader's Acad. Title	teacher	Module Leader's Qualification	M.S.C.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Raghad H.Saeed	e-mail	Raghad.h.alshekh@uomosul.edu.iq
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	
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Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	enhancing the student's knowledge of computers, their various applications, their software, which is used in a variety of industries, and the most recent technological advancements. The fundamentals of computers, common programs, viruses, and how to get rid of them are covered in this course. How to set up and operate office software and service packages. how to use email and the internet. The promotion of self-education, which enables the teacher to account for individual differences and ultimately improves the quality of learning and teaching, is one of the goals of using technology in the classroom. the capacity to fulfill educational objectives involving skills, such as learning, computer, and problem-solving Students are drawn to it because it is an interesting topic. because it is a fun way to break the student's monotonous memorization and work routine. It frees the teacher from spending time and effort on routine educational tasks, allowing him or her to devote more time and energy to designing learning situations and experiences that support the intellectual and social growth of students' personalities. creating programs that are simple to adapt to student needs presenting the scientific material, identifying students' areas of weakness, and providing corrective exercises that are appropriate for their needs accelerating learning and improving performance They aid in representing the difficult to provide real world
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- a thorough explanation of computer fundamentals, including a breakdown of hardware, software, and storage media. 2- An overview of Windows 0.8, including its features and windows, main screen elements, taskbar, mouse, and how to work with different programs and files. 3- An overview of Windows 0.8, including its features and windows, main screen elements and the taskbar, as well as the mouse, keyboard, numerical systems, and how to interact with various applications and files. 4- An overview of the main and submenus, features, and system of Microsoft

	Word 2016. 1- Overview of Microsoft Excel 2016, including a look at its features and instructions for adding worksheets.
Indicative Contents المحتويات الإرشادية	The course covers the following topics over the course of: an introduction to computers, their types, and the evolution of their generations; setting up a calculator and explaining its fundamental components; defining the hardware and software components of computers; types of storage media; and .viruses, their types, and how to avoid them 15 hours Introduction to Windows 0.8 and its features, windows, taskbar, mouse, and keyboard, as well as instructions on how to work with various programs and files .(5 hours) The Microsoft Word 2016 system and its features are introduced, along with the main and submenus (file, home page, insert), main menus (page layout, references, correspondence, review), and main menus (view, Introduction to the Microsoft Excel 2016 system, its features, worksheets, and methods for inserting them (15hours). Introduction to the Microsoft Excel 2016 system, its features, worksheets, and methods for inserting them (15 hours) . Discussion of the different types of data used in the program and methods for .dealing with cells Using mathematical and engineering equations and functions, using the most popular statistical functions, dealing with various graphs and graphs, and .representing data (15 hours) .Use of logical functions and conditional functions (5 hours) The Internet, including the World Wide Web and its elements, as well as e-mail, its .features and settings. Gmail, Yahoo, and college emails took (5 hours)

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The development of the computer and the Internet has had a significant impact on educational systems around the world because they are practical tools that can be used to enhance the educational process by continuously diversifying information and its modernity, diversifying the possibilities, developing communication skills in teams, fostering a climate of freedom in the classroom, and utilizing open education in universities. the ability to obtain current research from universities and research centers, the use of the Internet to publicize conferences and educational activities.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	79	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	46	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	2, 5	LO #1 and 4
	Assignments	3	20% (20)	4,7,12	LO # 2, 4 and 5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	0	0	0	0
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	المفردات المعطاة
Week 1	An introduction to computers and their types and the evolution of their generations, the installation of the calculator and its basic parts
Week 2	Clarification of the physical and software parts of the computer, storage media and their types, viruses and their types, and how to get rid of them
Week 3	Introduction to Windows 0.8 and its features and windows, components of the main screen and taskbar, mouse, keyboard, numeric systems, and how to deal with different programs and files
Week 4	Introduction to Microsoft word 2016 and its features and main and sub menus (file, home page, insert)
Week 5	Microsoft word 2016 and the main menus (page layout, references, correspondence, revision)
Week 6	Microsoft word 2016 and the main menus (display, design, layout)
Week 7	Introduction to Microsoft Excel 2016, its features, worksheets, and how to include them.
Week 8	Types of data used in the program and how to deal with cells

Week 9	How to insert different tables, and how to use and deal with pivot tables.
Week 10	How to represent data and deal with different graphics and charts.
Week 11	The use of mathematical and engineering equations and functions.
Week 12	Use of the most common statistical functions.
Week 13	The use of conditional functions, the use of logical functions.
Week 14	Communication networks, their types, advantages and disadvantages, the division of computer networks according to the carrier medium
Week 15	The Internet: the World Wide Web and its components, protocols, websites, services and engines. E-mail, its uses, features, how to configure it, and create a G mail account, a university email
Week 16	Preparatory week before the final exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	An introduction to computers, their generations, types, and their basic parts.
Week 2	How to install and use office packages and service software, mouse, keyboard

Grading Scheme

مخطط الدرجات

Week 3	Windows 0.8 system, its features and windows, the components of the home screen and the taskbar, and how to deal with various programs and files
Week 4	Microsoft word 2016 system and its main and sub menus in detail
Week 5	Microsoft word 2016 How to print different files and insert tables
Week 6	Microsoft Excel 2016 system, its windows and worksheets, how to insert graphs, data types, and how to use them.
Week 7	Microsoft Excel 2016 system and arithmetic, engineering and statistical functions.

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	لا يوجد	Yes
Recommended Texts	1 - تعلم تطبيقات الحاسوب الاساسية / للدكتور محمد عبد اللطيف ابراهيم 2 - دورات في كفاءة الحاسوب / مركز الحاسبة الالكترونية – جامعة الانبار	No
Websites	1- تعلم استخدام الحاسوب / مكتبة منبعث للدراسات والاستشارات العلمية on line 2- اساسيات الحاسوب/ مكتبة نور / للدكتور احمد محمد ابراهيم online Http:// Courses-Lectures.com	

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Environmental Science		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code			
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level		(Undergraduate)	
Administering Department		Type Dept. Code Department of Environmental Technologies	College Type College Code College of Environmental Science and Technologies
Module Leader	Dr.Eman A.M. Al-Jawadi Dr. Mayada Ahmed Al-Taii		e-mail emanaljawadi@uomosul.edu.iq maysbio55@uomosul.edu.iq
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification Ph.D./Chemistry Science
Module Tutor			e-mail E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	2
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	Course of ecology deals with the interactions between environmental factors and organisms, provides fundamental properties of the population ecology and interspecific relationships, and deals with the concept of communities and ecosystems. Distinct emphasis is on describing the structural, spatial and temporal dynamics within each level of ecological level (species, populations, communities, ecosystem, biome, the biosphere) as well as between different levels (e.g. the impact of changes in ecosystem characteristics of biological communities and population dynamics of organisms which compose such a community). The discussed issues are given in a very systemic way, which allows students a comprehensive understanding of the direct and indirect reciprocally but inseparable material, energy and information interactions between biotic and abiotic environmental factors. Course content allows students to develop a critical attitude towards anthropogenic-induced changes in ecological systems (from organism to biosphere), and enables them to apply the obtained new knowledge for development of sustainable management with ecological systems.
Module Learning Outcomes	Knowledge and understanding: Students will gain the ability to connect different levels of abiotic systems, they will understand their mutual and reciprocal interactions which will enable them to identify responses of ecological systems (from species to ecosystem) to changes of environmental factors. The acquired knowledge will enable them to design measures to reduce or eliminate undesirable impacts and to development new approaches that will help to improve the state of affected ecological systems. By this means, they will take into account the contents of other complementary courses in order to address ecological problems holistically and to develop their appropriate systemic solutions.
مخرجات التعلم للمادة الدراسية	The content of the curriculum integrates the sciences surrounding the environment and promotes the topics of biology, chemistry, geology, hydrology and their relationship with the environmental environment.

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Curriculum content deals with ecology holistically and with each of the ecological levels (species, communities, communities, ecosystem, biome, biosphere) incorporating and promoting topics of biology, chemistry, geology, and hydrology.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6 (93/15)
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8 (57/15)
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	3,5,7,12,14	LO #1, 2,3-4, 5-6,7-11 12and 13
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Tutorial	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	8	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Module Name	SSWL(hr/W)						Exam (hr/Sem)	SSWL (hr/Sem)	USSWL (hr/Sem)	SWL (hr/Sem)	ECTS
	CL (hr/W)	Lect (hr/W)	Lab (hr/W)	Pr (hr/W)	Tur (hr/W)	SEM (hr/W)					
Environmental Science 1 st Class	3	2			1		3	93	57	150	6
	45 (3/15)	30 (2/15)			15 (1/15)		3				

Delivery Plan (Weekly Syllabus) المناهج الاسبوعي النظري	
	Material Covered
Week 1	Intoduction , Concept of ecology , Components of ecosystem , Types of ecosysetm
Week 2	Ecological Balance ,Environmental problems, history and sustainability
Week 3	Energy / productivity /Ecological efficiencies and their relationship to the environmental system. Quiz1
Week 4	Succession.
Week 5	Food chain and food web ,Ecological pyramids.Quiz
Week 6	Biogeochemical cycles in the environment and human influence on them...1
Week 7	Biogeochemical cycles in the environment and human influence on them..2. . Quiz
Week 8	Midterm exam
Week 9	Limiting factors and tolerance levels
Week 10	Ecological factors & indicators
Week 11	Biodiversity
Week 12	Terrestrial, aquatic, marine ecology and communities Quiz
Week 13	Environmental problems .
Week 14	Environmental problems and the negative effects of the resulting pollutants on living organisms and the proposed methods of dealing with them...1. Quiz
Week 15	the negative effects of the resulting pollutants on living organisms and the proposed methods of dealing with them...2.
Week 16	Final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	• Smith, T. S., Smith, R. L., 2013. Elements of Ecology (8th edition), International edition, Benjamin Cummings, San Francisco, Boston, 688 str. Catalogue E-version • Odum, E. P., 2005. Fundamentals of Ecology – 5th edition. 624 str. E-version • Tome, D., 2006. Ekologija. Tehniška založba Slovenije	

	344 str. Catalogue	
Recommended Texts	• Tarman, K., 1992. Osnove ekologije in ekologije živali. DZS, Ljubljana, 547 str. Katalog • Selected scientific articles discussed as part of seminar exercises	
Websites		

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.				

MODULE DESCRIPTION FORM

Module Information				
Module Title	Analytical Chemistry		Module Delivery	
Module Type	core		☒ Theory ☒ Lecture ☒ Lab # Tutorial ☐ Practical ☐ Seminar	
Module Code				
ECTS Credits	8			
SWL (hr/sem)	200			
Module Level	1	Semester of Delivery	1	
Administering Department		College		
Module Leader	Yusra Majjed Al-shaker		e-mail	Yusra Majjed@uomosul.edu.iq
Module Leader's Acad. Title	أستاذ مساعد		Module Leader's Qualification	
Module Tutor	Mohammed Saadallah Younus Lena nofel mohammed salih Abeer Saleh Atiya Mustafa Amer Dhannoon		e-mail	Mohammed.Younus@uomosul.edu.iq
Peer Reviewer Name	Name	e-mail	E-mail	
Scientific Committee Approval Date		Version Number		

Relation with other Modules

Prerequisite module	Chem 1	Semester	1
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	1- Learning the Principles of Analytical Chemistry 2- Studying principles of Quantitative Analysis.. 3- Studying of Quantitative analysi. 4- Studying equation that used in preparation solution used in chemical analysis. 5- Studying types of volumetric titration in chemical analysis. 6- Studying principles of spectrophotometric analysis. 7- Studying deviations.
Module Learning Outcomes	1- knowing about principles of qualitative analysis. 2- knowing about principles of qualitative analysis. 3- knowing about principles of quantitative analysis. 4- knowing about equation that used in preparation solution used in chemical analysis. 5- knowing about types of volumetric titration used in chemical analysis. 6- knowing about prenciples of spectrophotometric analysis.

	8- knowing deviations.
Indicative Contents	Analytical chemistry is divided into two main parts; qualitative and quantitative analysis. Qualitative analysis includes knowing the composition of the sample without knowing its concentration. Quantitative analysis includes knowing sample composition and its concentration. Quantitative analysis includes two main methods; classical method and instrumental method. Classical methods are done by using glass equipments. Quantitative analysis is done by instrumental devices such as spectrophotometry and chromatography and others.

Learning and Teaching Strategies	
Strategies	Strategies of Teaching is knowing principles of chemical analysis and methods and apparatus used and instruments and techniques used.

Student Workload (SWL)

Structured SWL (h/sem)	120	Structured SWL (h/w)	8
Unstructured SWL (h/sem)	80	Unstructured SWL (h/w) ¹	5
Total SWL (h/sem)	200		

Module Evaluation					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	5	15% (15)		
	Assignments	5	15% (15)		
	Report	5	10% (10)		
Summative assessment	Midterm Exam	3 hr	10% (10)	7	
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Module Name	SSWL(hr/W)						Exam (hr/Sem)	SSWL (hr/Sem)	USSWL (hr/Sem)	SWL (hr/Sem)	ECTS
	CL (hr/W)	Lect (hr/W)	Lab (hr/W)	Pr (hr/W)	Tur (hr/W)	SEM (hr/W)					
Chemistry 2 (Analytical Chemistry) 1st Class	4	1	2		1		3	120	80	200	8
	60 (4/15)	15 (1/15)	30 (2/15)		12 (1/12)		3				

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Intoduction to analytical chemistry and Types of analytical chemistry
Week 2	Volumetric analysis and end point +
Week 3	Learning concentration , Molarity , Normality , ppm , % , + Quiz
Week 4	Type of reaction used in voumetric analysis and Acid – base titration + Quiz+ Assignments
Week 5	Oxidation – reduction titration + Quiz+ Assignments
Week 6	Precepitation titration + Quiz
Week 7	Mid-term Exam
Week 8	Complex titration
Week 9	Spectrophotometry + Quiz
Week 10	Beer – lambert equation
Week 11	Deviations + Report+ Quiz
Week 12	Chromatography +Assignments
Week 13	Atomic absorbtion+ Assignments
Week 14	Phlorecence and phosphorecence + Assignments
Week 15	IR techneque.
Week 16	final Exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
Week 1	Introduction to analytical chemistry
Week 2	Determination molarity of sodium hydroxide
Week 3	Determination molarity of Hydrochloric acid+ report
Week 4	Determination molarity of sodium carbonate and sodium bicarbonate+ report
Week 5	Determination molarity of sodium chloride (mohr method)
Week 6	Determination molarity of AgNO_3 (volhard method)+ report
Week 7	Determination molarity of sodium chloride (fajan method)
Week 8	Determination molarity of KMnO_4
Week 9	Determination of Co using spectrophotometry+ report
Week 10	Determination of Ni using spectrophotometry
Week 11	Determination of Fe using spectrophotometry + report
Week 12	Analysis of water using atomic absorption 1
Week 13	Analysis of water using atomic absorption 2
Week 14	Determination of some chemicals in different samples

Learning and Teaching Resources

	Text	Available in the

		Library?
Required Texts	اسس الكيمياء التحليلية. د. مؤيد قاسم العباي د. ثابت سعيد الغبشة	
Recommended Texts	التحليل الوصفي والحجمي. د. ثابت سعيد الغبشة د. مؤيد قاسم العباي	
Websites		

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

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Human rights and democracy		Module Delivery	
Module Type			☒ Theory ☒ Lecture ☒ Lab Tutorial Practical Seminar	
Module Code				
ECTS Credits	2			
SWL (hr/sem)	50			
Module Level	1	Semester of Delivery		2
Administering Department		College		
Module Leader	Yasir Shakir Mahmood		e-mail	yasirshakir.m@uomosul.edu.iq
Module Leader's Acad. Title	Teacher/ Doctor		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	30/06/2023		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None		Semester

Co-requisites module	None	Semester	
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Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. Introducing human rights and their general characteristics. 2. Human rights in Islamic law. 3. Fourth: Types of human rights, and new human rights. 4. The rights of weak and vulnerable groups. 5. Human rights in the Iraqi constitution of 2005, and guarantees of human rights. 6. The concept of democracy, its content, the characteristics of the democratic system, and its forms. 7. Contemporary political systems, the presidential and parliamentary system. 8. The democratic experience in Iraq and the problems it faced.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	10. Explanation of human rights in terms of definition and characteristics. 11. Clarification of human rights in ancient civilizations. 12. What is the role of the Code of Hammurabi in guaranteeing human rights? 13. Discuss and learn about human rights in Islamic law. 14. Explain the right to a clean environment of modern human rights within the scope of the third generation. 15. Mention the types of civil, political, economic, social and intellectual human rights. 16. The rights of vulnerable or vulnerable groups, such as children, women, the disabled, and the indigenous population. 17. Statement of human rights in the Iraqi constitution for the year 2005, and the guarantees of these rights. 18. Human rights guarantees and their protection at the national and international levels. 19. Discuss the content and content of democracy. 20. Clarifying the forms and images of democracy, direct democracy, indirect (parliamentary) democracy, and semi-direct democracy. 21. Clarification of contemporary political systems, the presidential system, and the parliamentary system. 22. Identify the problems faced by the democratic experiment in Iraq.

Indicative Contents المحتويات الإرشادية	The indicative content included the following. The indicative content included the following. Part A - Human Rights: The concept of human rights and their characteristics, human rights in ancient civilizations, human rights in divine laws. [6 hours] Human rights sections, types of human rights, civil, political, economic, social and intellectual rights. [3 hours] New Human Rights, Minority Rights, Rights of Vulnerable and Oppressed Groups [3 hours] Human rights in the Iraqi constitution of 2005. [3 hours] Human rights guarantees and their protection at the national level [3 hours] Human rights guarantees and their protection at the international level. [3 hours] Exam half course + Part B - Democracy: Definition of democracy, discussion of the content and content of democracy, goals of democracy. [3 hours] Clarification of forms and images of democracy, direct democracy, election methods: direct and indirect election .. [6 hours] Indirect (parliamentary) democracy, semi-direct democracy and its manifestations, popular referendum, popular objection, popular motion, the right of voters to be excluded. Parliament, the right to dissolve the People's Assembly, the right to dismiss the President of the Republic (a popular accusation). [3 hours] Contemporary political systems include: first: the presidential system, and second: the parliamentary system, and the distinction between the presidential system and the parliamentary system. [6 hours] The democratic experience in Iraq and the most important issues that can be referred to in the democratic transition in it, and the most important problems that the democratic experience faced in Iraq. [6 hours] End-of-course exam [2 hours]
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The main strategy that will be adopted in introducing this unit of study is to encourage students to engage in understanding the subject of human rights while improving and expanding their thinking skills at the same time. This is achieved through course contents that include everything related to human rights and democracy in a theoretical and streamlined manner.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	47	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	28	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative	Quizzes	2	10% (10)	5, 12	LO #1, 2, 10 and 11

assessment	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.				
	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	The concept of human rights and their characteristics.
Week 2	human rights in ancient civilizations, human rights in divine laws.
Week 3	Human rights divisions, types of human rights, civil, political, economic, social and intellectual rights.
Week 4	New human rights, human right to a clean environment and sustainable development. Minority rights, the rights of weak and vulnerable groups.
Week 5	Human rights in the Iraqi constitution of 2005.
Week 6	Human rights guarantees and their protection at the national level.
Week 7	human rights guarantees and their protection at the international level.
Week 8	Exam
Week 9	Definition of democracy, discussion of the content and content of democracy, goals of democracy.

Week 10	Forms and forms of democracy, direct democracy, and indirect (parliamentary) democracy, election methods: direct election and indirect election, semi-direct.
Week 11	democracy and its manifestations, popular referendum, popular objection, popular proposal, the right of voters to dismiss their representative, the right to popular dissolution of the parliament, the right Isolation of the President of the Republic (popular impeachment).
Week 12	Contemporary political systems include: first: the presidential system, second: the parliamentary system, and the distinction between the presidential system and the parliamentary system
Week 13	The democratic experience in Iraq and the most important issues that can be referred to in the democratic transition in it.
Week 14	and the most important problems that the democratic experience faced in Iraq.
Week 15	Comprehensive review of the article.
Week 16	End of course exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	nothing
Week 2	nothing
Week 3	nothing
Week 4	nothing
Week 5	nothing

Week 6	nothing
Week 7	nothing

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	r.. Muhammad Yunus Al-Sayegh, Democracy and Human Rights, Dar Ibn Al-Atheer for Printing and Publishing, University of Mosul, 2012.	Yes
Recommended Texts	Dr.. Orouba Jabbar Al-Khazraji, International Human Rights Law, 2nd Edition, Dar Al-Thaqafa for Publishing and Distribution, 2012.	No
Websites	Declaration of the Rights of the Man and of the Citizen of 1789. https://www.google.com/search?gs_ssp=eJzj4tDP1TcwsjTKNWD00rix9mbTzY6bTQo3lt9sAeK2G5tBpMLNDpDAzVYQfWP7zTYAr0welw&q	

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	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	MATHEMATICS II		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☒ Seminar
Module Code			
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	Bachelor's Degree	Semester of Delivery	3
Administering Department	Environmental Tech.	College	Environmental Science and Technology
Module Leader	Marwan Jameel	e-mail	marwan.jameel@uomosul.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Name	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Mathematics I	Semester	1
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	8. Introduce to matrix because the Matrices have wide applications in engineering, physics, economics, and statistics as well as in various branches of mathematics. Matrices also have important applications in computer graphics, where they have been used to represent rotations and other transformations of images. 9. The aim of this course is to give an introductory course on basics concepts of multi objective function analysis, to teach limit, partial derivative, multi-integral concepts and their applications. 10. To develop problem solving skills and understanding of Advance calculus theories through the application of techniques.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	23. A student defines some mathematical concepts which are essential in his/her field, 24. Gains the skill of interpreting some interrelations among these concepts, 25. Uses mathematical concepts in solving certain types of problems. 26. Calculates partial derivatives of functions. 27. Calculates multiple integrals and do applications of multiple integration.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Matrices and Determinants, Addition and subtraction of matrices.[15 hrs] Multiplication and transpose of matrices Adjoint of a square Matrix.[10 hrs] Inverse of a square Matrix.[10 hrs] Gramer's rule.[4 hrs] Vectors in plane, Vectors in space Dot and cross product, Lines and planes in three-dimensional space.[16 hrs] Partial derivatives, Chain rule.[12 hrs]

	Double integration rectangular coordinate. Triple integrals in rectangular coordinates.[13 hrs] Infinite serie,Sequences and series-convergence and divergence Convergence tests for series- Integral test, comparison test, the root and ratio test, Alternating series , Taylor and Maclaurin series. [10 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Activities are given in detail in the section of "Assessment Methods and Criteria" and "Workload Calculation" 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 in order to introducing the basic topics of analysis, to teach the concepts of limit, derivative, integration and their applications.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا
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Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation					
تقييم المادة الدراسية					
		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 11	LO #1, 2, 10 and 11
	Assignments	2	10% (10)	Per week	All
	Attendance	All	10% (10)	Per week	All
	Projects / Lab.	1	5% (5)	Continuous	All
	Report and seminar	1	5% (5)	Continuous	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hrs.	20% (20)	7	LO # 1-7
	Final Exam	2 hrs.	40% (40)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered

Week 1	Matrices and Determinants, Addition and subtraction of matrices
Week 2	Multiplication and transpose of matrices Adjoint of a square Matrix
Week 3	Inverse of a square Matrix
Week 4	Gaussian eliminations and linear system
Week 5	Cramer's rule
Week 6	Midterm exam Vectors in plane, Vectors in space
Week 7	Dot and cross product, Lines and planes in three-dimensional space
Week 8	Partial derivatives, Chain rule
Week 9	Double integration rectangular coordinate
Week 10	Triple integrals in rectangular coordinates
Week 11	Midterm exam, Infinite series
Week 12	Sequences
Week 13	series-convergence and divergence
Week 14	Convergence tests for series- Integral test, comparison test,
Week 15	the root and ratio test, Alternating series ,Taylor and Maclaurin series
Week 16	Final exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the
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		Library?
Required Texts	Thomas, Calculus and Analytic Geometry, Addison-Wesley 1996.	Yes
Recommended Texts	F. B. Hildebrand, Advanced Calculus for Applications, 2nd Edition, Prentice-Hall, 1976. 4.	No
Websites	https://www.youtube.com/playlist?list=PLF797E961509B4EB5	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Environmental Chemistry		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code				
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level		1 (Undergraduate)		
Administering Department		Type Dept. Code Department of Environmental Technologies	College	Type College Code College of Environmental Science and Technologies
Module Leader	Dr.Eman A.M. Al-jawadi		e-mail	emanaljawadi@uomosul.edu.iq
Module Leader's Acad. Title		Lecturer	Module Leader's Qualification	Ph.D./Chemistry Science
Module Tutor	Dr. Abdul Sattar Jubair Zaben <u>Practical lab lecturer's:</u> Mustafa Amer Dhannoon Alaa Jassim Mohammed Mohammed Saadallah Younus Lena nofel mohammed salih		e-mail	Sattarjubair @uomosul.edu.iq
Peer Reviewer Name		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	Chemistry 1+Chemistry 2		Semester
			1

Co-requisites module	None	Semester	
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Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The main aim of the course is to equip students with the knowledge of the chemical properties of elements and compounds, as well as about the chemical reactions essential for the emergence and existence of the cycling and accumulation of pollutants in the environment. The course addresses the chemistry of elements and compounds in the atmosphere, water and soil, and lays special emphasis on the processes that define the connections and the dependence between individual segments of environment. This knowledge is essential for the understanding of environmental phenomena, as well as for more specialised studies.
Module Learning Outcomes	Knowledge and understanding: Ability of describing the basic concepts and laws of chemistry both in theory and practice Ability to learn how to analyze and interpret information, and apply it in interdisciplinary and other discipline fields Students learn the basic principles of environmental chemistry (Content Solid-state and Liquid state environmental chemistry, Gaseous-state environmental chemistry, Applied environmental chemistry) . They will be able to apply previous knowledge on analytical chemistry to environmental processes and samples. They will understand the interconnections between different sectors of the environment (soil, water, atmosphere) and the effect of human activities on the natural chemical processes.
مخرجات التعلم للمادة الدراسية	Upon successful completion of this course, students will be able to describing the basic concepts and laws of chemistry both in theory and and apply it in interdisciplinary and other discipline fields.

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	The course Environmental chemistry provides students with basic knowledge useful in other courses, such as in the courses covering topics of atmospheric, water and soil pollution, the course Waste treatment and management, and others.

Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	108	Structured SWL (h/w)	7.2
الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	(108/15)
Unstructured SWL (h/sem)	67	Unstructured SWL (h/w)	4.46
الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	(67/15)

Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	175
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Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	4,6,10,12,15	LO #1 -3,4-5,8-9,19-12and 13-14
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7
	Tutorial	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 # 1-6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Module Name	SSWL(hr/W)						Exam (hr/Sem)	SSWL (hr/Sem)	USSWL (hr/Sem)	SWL (hr/Sem)	ECTS
	CL (hr/W)	Lect (hr/W)	Lab (hr/W)	Pr (hr/W)	Tur (hr/W)	SEM (hr/W)					
Environmental Chemistry 2 nd Class	3	1	2		1		3	108	67	175	7
	45 (3/15)	15 (1/15)	30 (2/15)		15 (1/15)		3				

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Environmental Chemistry
Week 2	Biogeochemical cycles for various elements and effects of human-related pressures. 1
Week 3	Biogeochemical cycles for various elements and effects of human-related pressures. 2
Week 4	Biogeochemical cycles for various elements and effects of human-related pressures. 3. Quiz
Week 5	Atmospheric chemistry : Atmospheric Components, Chemical and Photochemical Reactions in the Atmosphere (Structure and chemical-physical characteristics of the atmosphere.)
Week 6	solubility of atmospheric pollutants in water; large-scale climate effects, including human related climate change, chemistry of acid deposition (Photochemical Smog, .Acid Rains) Quiz
Week 7	Midterm exam , Global Warming..1
Week 8	Global Warming" Greenhouse Effect"..2, Thinning of the Ozone Layer
Week 9	The hydrosphere: Water Chemistry and Water Pollution Chemical composition and physical properties; water cycle
Week 10	water pollution; large-scale human-related effects Resources and Types of Water Pollutants , The Qualification of Water Quality. Quiz
Week 11	The lithosphere (Soil and Soil Pollution) composition and structure; weathering; leaching; soil chemistry;
Week 12	Sources and Types of Soil pollutants (mineral resources and pollution; geochemical solubility.), Determination of Soil Quality. Quiz
Week 13	The biosphere Composition, major and minor elements; toxicology of heavy metals and organic pollutants, bioaccumulation
Week 14	Methodologies and techniques for studying the interaction environment-materials. .Radioactive Substances and Reactions, Radioactive Wastes. 1

Week 15	Methodologies and techniques for studying the interaction environment-materials. Radioactive Substances and Reactions, Radioactive Wastes.2 . Quiz
Week 16	Final exam

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Physical properties of natural and industrial water and wastewater (temperature, taste, color)
Week 2	Odor testing of natural water and waste water
Week 3	Water turbidity and methods of field measurement
Week 4	Electrical conductivity of water (EC)
Week 5	pH of water
Week 6	Acidity and alkalinity of water
Week 7	Total hardness of water and its impact
Week 8	Dissolved oxygen in water and methods of its measurement
Week 9	COD
Week 10	BOD
Week 11	determination of phosphate ions in water
Week 12	Estimation of nitrate ion in water
Week 13	Determination of sodium ion in water
Week 14	Determination of potassium ions in water
Week 15	Measure the concentration of carbon dioxide and carbon monoxide in the air

Week 16	Final exam
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Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	• C. Baird, Environmental Chemistry, W. H. Freeman and Company, 1998. Catalogue E-version • D. W. Hawker, D. W. Conell, M. Warne, P. D. Vowles: Basic Concepts of Environmental Chemistry, Lewis Publishers, Inc., 1997. E-version	
Recommended Texts	• R. P. Schwarzenbach, P. M. Gschwend, D. M. Imboden: Environmental Organic Chemistry, J. Wiley and Sons, Inc. 1998. Catalogue E-version • G. Howard: Aquatic Environmental Chemistry, Oxford Science Publ., 1998. Catalogue E-version • S. E. Manahan: Environmental Chemistry, Lewis Publishers, Inc., 1994. E-version	
Websites		

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Fluid		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code			
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	Semester of Delivery	1
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Dr. Tahseen Ali Gelmirn	e-mail	tahssenali1967@uomousl.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
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 the student's skills to understand the principle of fluids and units of measurement and to deal with them through environmental systems. 2. To understand the methods of dealing with fluids and their properties. 3. This course deals with the calculation of the forces exerted by fluids on submerged and floating objects. 4. Learn about fluid pressure measuring devices and methods for calculating the pressure applied by the fluid. 5. Learn how to calculate the discharge in pipes and methods of analyzing and designing pipe networks.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Learn about the concept of fluids. 2. Identify the basic units for measuring all fluids in the international unit measurement systems. 3. Describe fluid properties. 4. Identify the methods of analyzing the forces exerted by fluids on submerged and floating objects. 5. Using different devices to measure pressure in fluids practically and calculate fluid pressure theoretically. 6. Learn about the law of continuity of liquids and the calculation of discharge. 7. Learn about Bernoulli's equation and its applications. 8. Learn about the Venturi meter and its applications. 9. Learn about methods of measuring and calculating losses in pipes. 10. Learn about the methods of designing pipeline networks.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Learn about the concept of fluids and their properties and how to calculate the mass density, weight density and specific weight of fluids, identify the standard events of fluids in the international measurement systems, calculate the forces applied to the surfaces immersed in the fluid vertically, horizontally or inclined, or if these surfaces are curved, calculate the forces exerted on Objects floating on a fluid. [25 hrs]

	Understanding the concept of pressure in fluids, the devices used to measure pressure in practice, and the laws for calculating pressure in fluids.[25 hrs] Identifying the devices for calculating losses in pipes practically in the laboratory and the laws and equations used in calculating them, using the devices and special methods for measuring discharge in the laboratory and identifying the laws and equations for calculating it theoretically. [25 hrs] Designing pipe networks, calculating their diameters, methods of connecting these networks, calculating the fluid velocity inside the pipe, the amount of pressure applied to it practically in the laboratory, and the theoretically used laws and equations.. [27 hrs] Revision problem classes [6 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in presenting this unit is to encourage students to participate and interact with the material through the course, while improving, expanding, and nurturing thinking skills, and to train students in scientific and logical thinking methods and to learn about the concept of fluids. This will be achieved through the scientific material of the course, interactive educational programs and its practical and laboratory applications, and through the development of logical methods for scientific thinking and linking the scientific material and its application in practical life. This is done through identifying the fluid's physical characteristics such as mass density, weight density, specific weight, viscosity, surface tension property, identifying its units of measurement in the international measurement systems, getting acquainted with pressure measurement devices practically and learning to calculate pressure theoretically through mathematical theories and equations, and addressing To the forces affecting floating and submerged objects in fluids, how to analyze and calculate these forces, as well as

	identifying pressure and velocity analysis, calculating the discharge in pipes, determining their diameters, how to connect them, and calculating the losses that occur practically in the laboratory and theoretically through laws and theories Her own.
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Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	105	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	70	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	15% (10)	3, 5 and 13	LO #1-2, 3-5 and 7-9
	Assignments	2	15% (10)	2, 5, 10 and 14	LO # 1-2, 3-5, 6-7 and 8-9
	Projects / Lab.				
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Fluid mechanic fundamentals, physical characteristic unit, density, weight density, specific gravity
Week 2	Viscosity, surface tension, capillarity

Week 3	Gauge pressure, manometer
Week 4	Force on submerged plane (vertical, horizontal, and inclined)
Week 5	Force on submerged on curved surface
Week 6	Force on flotation plane
Week 7	Mid-term Exam
Week 8	Fluid dynamic, rate of flow, equation of continuity
Week 9	Types of flow, Bernoulli's equation
Week 10	Venturi meter, orifice meter
Week 11	Type of orifices, flow through an orifice, coefficient of discharge, coefficient of velocity, coefficient of contraction
Week 12	Loss of head in pipes
Week 13	Hydraulic gradient line, total energy line
Week 14	Pipes in parallel
Week 15	Pipes in series
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Center of pressure on immersed surface
Week 2	Lab 2: Forces due to jet impact on plates
Week 3	Lab 3: Bernoulli's equation
Week 4	Lab 4: Reynolds number in pipe

Week 5	Lab 5: Flow through orifice
Week 6	Lab 6: Friction factor in pipes
Week 7	Lab 7: Discharge measurement in pipes by Venturi meter
Week 8	Lab 8: Discharge measurement by wiers

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Fundamentals of Fluid Mechanics, Munson, Okiishi, Huebsch and Rothmayer تجارب في الهيدروليك ، مؤيد سعدالله	Yes
Recommended Texts	Fluid Mechanics, R. K. Rajput	
Websites		

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	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	HYDROLOGY		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code			
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester of Delivery	1
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Ali Zain Al-Abdeen	e-mail	aalozeer@uomosul.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Farah Khazal	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Geology	Semester	1 or 2
Co-requisites module	Water quality	Semester	2

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	• Understand the Water Cycle: Students should develop a deep understanding of the processes and interactions involved in the water cycle, including precipitation, evaporation, condensation, runoff, infiltration, and groundwater flow. • Comprehend Hydrological Systems: Students should gain knowledge of the components and characteristics of hydrological systems, such as rivers, lakes, groundwater aquifers, and watersheds. They should understand how these systems interact and influence water availability and distribution. • Measure and Analyze Hydrological Data: Students should learn to collect hydrological data using appropriate measurement techniques and instruments. They should also develop skills in analyzing and interpreting hydrological data, including streamflow measurements, groundwater levels, rainfall data, and water quality parameters. • Apply Hydrological Models: Students should acquire the ability to use hydrological models to simulate and predict hydrological processes. They should learn to select and apply appropriate models for various hydrological phenomena, interpret model outputs, and assess their accuracy and limitations. • Assess Water Resources: Students should be able to assess water resources in a given area, considering factors such as water availability, water demand, and water quality. They should learn to evaluate the impacts of human activities and climate change on water resources and develop strategies for sustainable water management. • Analyze and Manage Floods and Droughts: Students should understand the causes, impacts, and management of floods and droughts. They should learn to analyze flood and drought risks, develop floodplain management strategies, and propose measures for drought preparedness and mitigation. • Understand Water Quality and Pollution: Students should gain knowledge of water quality parameters, including physical, chemical, and biological characteristics. They should understand the sources and impacts of water pollution, evaluate water quality data, and propose strategies for water quality improvement and pollution prevention. • Communicate and Present Hydrological Information: Students should develop effective communication skills to convey hydrological concepts, data, and findings to different audiences. They should be able to present technical information clearly, write reports, and engage in scientific discussions.
Module Learning	1. Demonstrate a comprehensive understanding of the water cycle and its components.

Outcomes مخرجات التعلم للمادة الدراسية	2. Collect, analyze, and interpret hydrological data accurately and effectively. 3. Apply hydrological models to simulate and predict hydrological processes. 4. Evaluate and manage water resources, considering sustainability and environmental factors. 5. Assess and manage flood and drought risks, and develop appropriate mitigation strategies. 6. Understand water quality parameters and propose measures for water quality improvement. 7. Communicate hydrological concepts and findings to technical and non-technical audiences. 8. Work collaboratively in interdisciplinary teams to address hydrological challenges. 9. Develop analytical and critical thinking skills. 10. Study the effects of water on the environment and health. 11. Awareness of the importance of water conservation.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. A- Surface water: 1. Introduction to Hydrology: (6h) • Definition and scope of hydrology • Importance of hydrology in water resources management • Historical development of hydrology 2. Water Cycle: (8h) • Overview of the water cycle components (precipitation, evaporation, transpiration, infiltration, runoff) • Processes and factors influencing each component • Quantification of water cycle components 3. Precipitation and climate: (12h) • Types of precipitation (rainfall, snowfall, hail, etc.) • Measurement and recording of precipitation • Analysis and interpretation of precipitation data • Spatial and temporal variability of precipitation 4. Evaporation and Evapotranspiration: (12h) • Evaporation and its factors (temperature, wind, humidity, etc.) • Evaporation measurement techniques • Evapotranspiration processes and estimation methods (potential and actual evapotranspiration) 5. Infiltration and Soil Water: (12h) • Infiltration processes and factors affecting infiltration rates • Measurement and estimation of infiltration • Soil water storage and movement • Soil moisture measurement techniques 6. Runoff and Streamflow: (14h) • Runoff generation processes (infiltration excess, saturation

	excess) • Runoff estimation methods (unit hydrograph, rational method, etc.) • Streamflow measurement techniques (stream gauging, flow measurement structures) • Analysis of streamflow data 7. Hydrological Analysis: (10h) • Hydrological data collection and analysis techniques • Statistical analysis of hydrological data 8. Floods and Flood Frequency Analysis: (8h) • Flood characteristics and causes • Flood frequency analysis methods (probability distributions, flood quantiles) • Flood estimation and design flood determination B- Groundwater: 9. Groundwater Hydrology: (15h) • Introduction to groundwater systems. • Aquifer properties and characterization. • Layers types • Aquifers types. • Groundwater flow equations and Darcy's law. • Groundwater exploration and well hydraulics. 10. Hydrological Applications: (8h) • Water resources management and planning • Hydrological aspects of environmental impact assessments • Water-related hazards (droughts, floods, etc.) and risk assessment Climate change and its implications for hydrology
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1. Lecture-Based Instruction: Start with traditional lectures to introduce fundamental concepts, theories, and principles of hydrology. Use visual aids such as slides, diagrams, and charts to enhance understanding. 2. Case Studies: Engage students with real-world case studies that illustrate the application of hydrological principles. Analyzing actual hydrological data and discussing the challenges and solutions faced in various scenarios can deepen students' understanding of the subject. 3. Field Trips and Hands-on Experiments: Arrange field trips to water bodies, hydrological facilities, or research centers to provide students

	with practical exposure to hydrological processes. Conduct hands-on experiments, such as measuring streamflow or groundwater levels, to help students apply theoretical knowledge in a tangible way. 4. Problem-Solving Exercises: Design problem-solving exercises that require students to analyze and solve hydrological problems. This can include calculating water balance, analyzing rainfall patterns, or predicting flood risks. Encourage group discussions and peer learning to foster collaborative problem-solving skills. 5. Computer Modeling and Simulations: Utilize hydrological modeling software and simulations to demonstrate complex hydrological processes. These tools can help students understand concepts like rainfall-runoff modeling, flood forecasting, and groundwater flow. 6. Guest Lectures and Expert Talks: Invite guest speakers, such as hydrologists, water resource engineers, or researchers, to share their experiences and insights. These sessions can provide students with a broader perspective on the practical applications of hydrology and inspire them for future careers. 7. Interactive Discussions: Facilitate interactive class discussions on current hydrological issues, challenges, and debates. Encourage students to critically analyze different viewpoints and propose innovative solutions. This approach promotes critical thinking and enhances students' ability to apply hydrological principles in real-world contexts. 8. Multimedia Resources: Incorporate multimedia resources like videos, documentaries, or online tutorials to supplement classroom instruction. These resources can visually illustrate hydrological processes, showcase innovative technologies, and demonstrate real-world hydrological events. 9. Assessments and Feedback: Implement a variety of assessment methods, including quizzes, assignments, presentations, and projects, to evaluate students' comprehension and application of hydrological concepts. Provide timely feedback to help students identify areas for improvement and encourage their active participation in the learning process. 10. Collaborative Learning: Promote collaborative learning through group projects or activities that require students to work together to solve hydrological problems or conduct research. This approach fosters teamwork, communication skills, and a deeper understanding of the subject through collective effort.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	109	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	7
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	70	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.6
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)	6, 13	LO #1, 2, 10 and 11
	Assignments	2	5% (5)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	20% (20)	Continuous	All
	Report	1	5% (5)	14	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	Introduction to Hydrology, Water Cycle and Water balance.
Week 2	Precipitation, Types of precipitation, Measurement and recording of precipitation.
Week 3	Analysis and interpretation of precipitation data, Spatial and temporal variability of precipitation, Definition Evaporation and Evapotranspiration.
Week 4	Evaporation and its factors, Evaporation measurement techniques, Evapotranspiration processes and estimation methods.
Week 5	Infiltration, Infiltration processes and factors affecting infiltration rates, Measurement and estimation of infiltration.
Week 6	Soil water storage and movement, Soil moisture measurement techniques.
Week 7	Runoff, Runoff generation processes, Runoff estimation methods, Floods and Flood Frequency Analysis.
Week 8	Flood characteristics and causes, Flood frequency analysis methods (probability distributions, flood quantiles).
Week 9	Flood estimation and design flood determination, Streamflow measurement techniques, Analysis of streamflow data
Week 10	Hydrological Analysis, Hydrological data collection and analysis techniques, Statistical analysis of hydrological data
Week 11	Introduction to groundwater systems, Aquifer properties and characterization.
Week 12	Aquifers types, layers types
Week 13	Groundwater flow equations and Darcy's law, Groundwater exploration and well hydraulics.
Week 14	Hydrological Applications, Water resources management and planning
Week 15	Hydrological aspects of environmental impact assessments, Water-related hazards and risk assessment Climate change and its implications for hydrology
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Elements of the hydrological cycle and conversion of hydrological units.
Week 2	Lab 2: Water balance
Week 3	Lab 3: precipitation: its types, methods of measurement, the adequacy of stations, and the calculation of missing data
Week 4	Lab 4: Checking the consistency of rain records and rain data presentation methods
Week 5	Lab 5: Calculating the rate of precipitation over an area + frequency of rainfall
Week 6	Lab 6: Evaporation: evaporation measures + experimental evaporation equations
Week 7	Lab 7: Evapotranspiration equations + practical evaporation rate calculation
Week 8	Lab 8: Infiltration: infiltration capacity + infiltration measurement in practice + infiltration capacity values
Week 9	Lab 9: Examples of the Horton equation for infiltration
Week 10	Lab 10: Infiltration index
Week 11	Lab 11: Methods for calculating river discharge
Week 12	Lab 12: Hydrograph
Week 13	Lab 13: Morphometric characteristics of water basins
Week 14	Lab 14: Forms of Subsurface Water and Darcy's Law
Week 15	Lab 15: Determine the direction of groundwater flow

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	مبادئ الهيدرولوجي ، (نظير الانصاري، 1979) علم المياه وتطبيقاته، (باقر احمد، 1982) هيدرولوجية المياه الجوفية، (ديفيد توود 1959)، ترجمة رياض حامد الدباغ، وحميد رشيد رفيق "Applied Hydrology" by Ven Te Chow, David R. Maidment, and Larry W. Mays (1988). "Introduction to Hydrology" by Warren Viessman Jr., Gary L. Lewis, and John W. Knapp (2013) "Groundwater Hydrology" by M.A. Todd and L.W. Mays (2004)	Yes
Recommended Texts	DC Electrical Circuit Analysis: A Practical Approach Copyright Year: 2020, dissidents.	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/electrical-engineering	

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	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	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.

MODULE DESCRIPTION FORM

Module Information					
Module Title	Environmental statistic		Module Delivery		
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar		
Module Code					
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		2	Semester of Delivery		2
Administering Department		Environmental Technology	College	environmental science and technology	
Module Leader	Muthaina . A. Mustafa		e-mail	Muthaina@uomosul.edu.iq	
Module Leader's Acad. Title		teacher	Module Leader's Qualification		M.S.C.
Module Tutor	Name (if available)		e-mail	E-mail	
Peer Reviewer Name		Name	e-mail	E-mail	
Scientific Committee Approval Date		01/06/2023	Version Number		1.0

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

Module Aims, Learning Outcomes and Indicative Contents
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Module Aims	Statistics is considered one of the important means in scientific research, whose methods and tools are included in various fields of life, so that it is qualified to have a basic share in the work of countries, institutions and organizations on which economic and social development depends globally and locally by relying on the results it provides in a specific field. From this standpoint comes the importance Statistics is one of the important means that uses its rules, laws and different methods in the process of collecting, summarizing, presenting and analyzing data and interpreting results. Therefore, we seek to develop the student's skills and enrich him with information about statistics, its symbols, tools, various uses, and its software used in various fields. As for the environmental field, our goal was to harness statistical tools in solving environmental problems by taking samples of water or air pollution and even soil, analyzing them statistically, interpreting the results and presenting appropriate solutions.manually and compare the results practically through the use of ready-made statistical programs, including the SPSS program, discussing and interpreting the results, as well as enriching the student with modern information, keeping pace with the rapid technological development in this field, and seeing the latest findings in the field of data science and artificial intelligence.
Module Learning Outcomes	1- using the student to the importance of statistics and its uses in various sciences and its symbols 2- Focusing on the importance of statistics and its various uses in the environmental field 3- Methods of statistical data collection, graphic representation and tabular presentation. 4- General steps to create a frequency distribution table. 5- Frequency and cumulative distributions. 6- Measures of central tendency for classified and ungrouped data. 7- Measures of dispersion for classified and ungrouped data. 8- Simple, partial and multiple correlation and adjective correlation 9-Simple and multiple regression

Learning and Teaching Strategies

Strategies	Encouraging students to participate in solving exercises, discussing the results, interpreting them scientifically and linking them to reality, motivating students to include some pollution problems and working to find appropriate statistical solutions for them through the use of statistical programs and comparing the results of the practical side with the theoretical one to consolidate theoretical concepts .
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Student Workload (SWL)

Structured SWL (h/sem) The regular academic load of the student during the semester	79	Structured SWL (h/w) The student's regular study load per week	5
Unstructured SWL (h/sem) The irregular academic load of the student during the semester	46	Unstructured SWL (h/w) Irregular academic load for the student per week	2
Total SWL (h/sem) The total academic load of the student during the semester	125		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	6 , 10	LO #6 and 7
	Assignments	3	20% (10)	5, 10,13	LO #6, 7 and 8
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	0	0	0	0
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 3-9
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	given vocabulary
Week 1	Introduction to statistics, its uses, divisions, development, and the most important statistical codes used
Week 2	Methods of statistical data collection, tabular presentation and graphic implementation
Week 3	General steps to create a frequency distribution table
Week 4	Clustered distributions and graphical representation, frequency distributions and their types
Week 5	Centering measures for grouped and ungrouped data (arithmetic mean, geometric mean)
Week 6	Centering measures for tabulated and ungrouped data (square mean, harmonic mean)
Week 7	Centering measures for grouped and ungrouped data (modal, median)
Week 8	Measure of dispersion for grouped and ungrouped data (mean deviation, variance, standard deviation)
Week 9	Standard score and coefficient of difference
Week 10	Torsion modulus and flattening coefficient
Week 11	Simple and multiple correlation
Week 12	partial correlation
Week 13	adjective correlation
Week 14	simple regression
Week 15	Multiple Regression
Week 16	Preparatory week before the final exam

Delivery Plan (Weekly Lab. Syllabus)	
	Material Covered
Week 1	An introduction to the SPSS statistical program, how to install it, its uses and characteristics
Week 2	Initializing input files, explaining program windows, using the view window, clarifying its commands, and applying examples
Week 3	How to use the Data window and apply its commands, supported by illustrative examples
Week 4	How to use the Transformation window and apply its commands, supported by illustrative examples
Week 5	Apply centering and dispersion measures through the Analyze window
Week 6	Ensure the normal distribution of the data and conduct a sample sufficiency test for the data through the Analyze window
Week 7	Apply simple and multiple correlation and interpret results through the Analyze window
Week 8	Apply partial correlation and trait correlation and interpret the results through the Analyze window
Week 9	Apply simple and multiple regression and interpret the results through the Analyze window

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Introduction to statistics / dr.Kashia Mahmoud Al-Rawi	Yes
Recommended Texts	1-Introduction to descriptive and inferential statistics / Dr. AZ Hassan Abdel-Fattah 2- Analytical Statistics with SPSS Software Applications / Dr. Nabil Juma Saleh Al-Najjar	No
Websites	1- https://www. Gulfup.com/?EJrm4x	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Environmental geology		Module Delivery
Module Type			☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code			
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	Semester of Delivery	2
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Dr. Hazim Jumaa Mahmood		e-mail
		hazimjm@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Geology	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. Providing students with information and understanding about the most important surface and interior geological processes, along with their environmental consequences, as well as experience with topographical and geological maps. 2. Understanding the fundamental principles of geochemical exploration and the background concentrations of chemical elements, and applying this knowledge to the investigation of natural and anthropogenic causes of pollution. 3. Understanding the nature of basic geological processes and their relationship to natural hazards, as well as determining the areas most vulnerable to geological hazards and their impact on human life.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Describe the fundamental Concepts of Environmental Geology 2. The ability to apply basic geochemical exploration concepts to environmental concerns. 3. Identify the types of plate boundaries and their relationship to crustal 4. Describe the interactions between tectonic plates and volcanic eruptions and earthquakes. 5. Understand environmental problems derived from aspects of geological processes. 6. Describe the main causes of environmental and geological natural disasters such as earthquakes, volcanoes, landslides and subsidence. 7. Determine the area most likely to be exposed to natural hazards. 8. construct and interpret geologic and topographic maps, cross-sections, and topographic profiles
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to Environmental Geology, Fundamental Concepts of Environmental Geology. [3 hrs] <u>Part A - geological environments and exploration</u> Geochemical environments. [5 hrs] Geochemical exploration, basic understanding, methods of geochemical survey. [13hrs] Geochemical Anomalies and Mineral Deposits. [3 hrs] <u>Part B -Plate tectonics, Earth Processes and Natural Hazards</u> Plate tectonics. [5 hrs] Internal Earth Processes and Natural Hazards. [12 hrs] Surface Earth Processes and Natural Hazards. [9 hrs]

	Mineral and Rock Resources. [3 hrs] Construct and interpret geologic and topographic maps, cross-sections, and topographic profiles. [14 hrs] Natural hazard risk assessments. [3 hrs]
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	This course will be delivered through a combination of lectures, discussions, exercises, and lab. The key strategy for presenting this subject will be to stimulate student participation while also polishing and strengthening their critical thinking skills. Student learning will be assessed through graded laboratory tests and examinations covering lecture content and through practical quizzes on lab exercises.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

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	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	15% (15)	5, 12	LO #1, 2, 4, 5 and 7
	Assignments				
	Lab.	4	20% (20)	2,4,6,8	8
	Report	1	5% (5)	13	LO # 3-7
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Environmental Geology
Week 2	geochemical environments
Week 3	geochemical exploration, basic understanding
Week 4	Methods of geochemical survey
Week 5	Geochemical Anomalies and Mineral Deposits + Quiz
Week 6	Plate Tectonics
Week 7	Mid-term Exam
Week 8	Earth Processes and Natural Hazards
Week 9	Earthquakes and Related Phenomena
Week 10	World Distribution of Earthquakes and seismic belts
Week 11	Volcanic Activity
Week 12	Mass Movements + Quiz
Week 13	Streams and Flooding
Week 14	Drought and desertification
Week 15	Mineral and Rock Resources
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Types of maps and map scale
Week 2	Lab 2: Topographic maps
Week 3	Lab 3: Topographic profile
Week 4	Lab 4: Geological maps and Cross-sections
Week 5	Lab 5: : Geological maps (horizontal strata)
Week 6	Lab 6: : Geological maps(vertical strata)
Week 7	Lab 7: Geological maps(Inclined strata)
Week 8	Lab 8: Natural hazard risk assessments

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Environmental geology, (2020), Carla W. Montgomery. — 11th ed.	
Recommended Texts	Environmental geology, (2016), ghazi et al.	
Websites		

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	English Language 2		Module Delivery
Module Type	B		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	UOM2022		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	2	Semester of Delivery	2
Administering Department		College	College of Environmental Sciences
Module Leader	Wissam Saeed	e-mail	
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	M.A.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
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 introduce Future tense. 2. To improve basic English skills (reading-writing-speaking- listening). 3. To support the highest degree of academic achievement by students who are not native speakers of English. 4. To determine how words function in a sentence. 5. To encourage students to express themselves in English. 6. This course introduces the principles of academic writing. 7. To introduce a number of important environmental terms.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Explain English verbs and how to use them. 2. Explain English adverbs and how to use them. 3. Explain English prepositions and how to use them. 4. Discuss conversation skills and encouraging students to participate in a dialogue. 5. Improve the pronunciation skills of students. 6. Introduce the main functions of English grammar. 7. Explain English modals. 8. Illustrate future tense. 9. Discuss regular and irregular verbs. 10. Identify Negatives and Question words. 11. Explain requests and offers. 12. Review types of sentences in English. 13. Explain requests and offers. 14. Enable students to read different scientific texts. 15. Introduce the most important environmental terms.

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A- Parts of speech: Introduction - Identify the main parts of speech in English. – Verbs (definition, types, and use of adjectives) – Adverbs (definition, types, and use of adverbs) – Prepositions (definition, types, and use of verbs) [14 hrs] Part B- Conversation skills: Encouraging students to express themselves in English – to talk about science using English – improvement of pronunciation skills [4 hrs] Revision problem classes [2 hrs] Part C- English grammar: Introduction - future tense -Negatives – Questions- Requests and offers –Types of sentences in English – academic writing – environmental terminology [22 hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Some effective strategies will be adopted in delivering this module such as, focusing on academic language, vocabulary exercises. Students will be given an opportunity to produce language through reading and speaking with receiving direct feedback to increase their comprehension and improve their language skills. This will be achieved through classes, group discussion, solving exercises, participation in conversations, interactive learning and writing activities that are interesting to the students.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	30	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	15	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	10% (10)	5, 10	LO # 1, 2, 3, 6, 8, 9, 10, and 13
	Online Assignments	1	10% (10)	2, 7, 12	LO # 2, 4, 5, 10, 11, 12, 13 and 14
	Onsite Assignments	1	10% (10)	2, 7, 12	LO # 2, 4, 5, 10, 11, 12, 13 and 14
	Projects / Lab.	0	0% (0)		
	Report	1	10% (10)	13	LO # 1, 6 and 12
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Explain English verbs and how to use them.
Week 2	Explain English adverbs and how to use them.
Week 3	Explain English prepositions and how to use them.
Week 4	Discuss conversation skills and encouraging students to participate in a dialogue.
Week 5	Improve the pronunciation skills of students.
Week 6	Introduce the main functions of English grammar.
Week 7	Mid-term Exam
Week 8	Explain English modals.
Week 9	Illustrate future tense.
Week 10	Discuss regular and irregular verbs.
Week 11	Identify Negatives and Question words.
Week 12	Explain requests and offers.
Week 13	Review types of sentences in English.
Week 14	Explain requests and offers.
Week 15	Environmental Terminology
Week 16	The final Exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Liz and John Soars, 2010, Headway, Oxford University Press.	No
Recommended Texts	English Grammar in Use, Raymond Murphy , 2nd edition, Cambridge University Press.	No
Websites		

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Fluid 2		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code			
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	Semester of Delivery	2
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Dr. Tahseen Ali Gelmirn	e-mail	tahssenali1967@uomousl.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date		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	4. Learn how to calculate the discharge in pipes and methods of analysis. 5. Design of parallel pipe networks. 6. Design of series pipe networks. 7. Design of compounds pipe networks. 8. Identify the types of open channels. 9. Identify open channel design methods.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	9. Learn about methods of measuring and calculating losses in pipes. 10. Learn about the methods of designing pipeline networks. 11. Identify methods for calculating losses in pipes. 12. Identify the types of open channels and how to design them.
Indicative Contents المحتويات الإرشادية	Identify the characteristics of fluid flow in pipes using different connection methods, calculate the discharge in these pipes, the speed of fluid flow in them, and how to calculate the appropriate diameters for transporting these fluids. [25 hrs] Learn about several methods for calculating losses in pipes according to the method of connecting them and calculating the pressure and speed of fluid flow in the pipes.[24 hrs] Learn about the types of open channels and how to design them.[15hrs] Identifying the devices for calculating losses in pipes practically in the laboratory and the laws and equations used in calculating them, using the devices and special methods for measuring discharge in the laboratory and identifying the laws and equations for calculating it theoretically. [20 hrs] Revision problem classes [6 hrs]
Learning and Teaching Strategies استراتيجيات التعلم والتعليم	

Strategies	The main strategy that will be adopted in presenting this unit is to encourage students to participate and interact with the material throughout the course, while improving, expanding and nurturing their thinking skills, and training students on scientific and logical thinking methods and learning about the concept of fluids. This will be achieved through the scientific material of the course, interactive educational programs and their practical and laboratory applications, and by developing logical methods for scientific thinking and linking the scientific material and applying it in practical life. This is done by learning about the physical properties of fluids, learning about pressure measuring devices practically, learning to calculate pressure theoretically through mathematical theories and equations, learning about methods of analyzing pressure and velocity, calculating discharge in pipes, determining their diameters, how to connect them, and calculating the losses that occur during them practically in the laboratory and theoretically through their laws and theories. As well as learning about the types of open channels and the design equations for open channels.
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Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	3	15% (10)	3, 5 and 13	LO #1-2, 3-5 and 7-9
	Assignments	2	15% (10)	2, 5, 10 and 14	LO # 1-2, 3-5, 6-7 and 8-9
	Projects / Lab.				
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Flow Through Simple Pipes
Week 2	Loss of Head in Pipes, Darcy Formula
Week 3	Chezy Formula
Week 4	Hydraulic Gradient Line and Total Energy Line
Week 5	Minor Energy Losses

Week 6	Pipes in Parallel
Week 7	Pipes in Series
Week 8	Mid-term Exam
Week 9	Compound Pipes
Week 10	Compound Pipes
Week 11	Open Channel
Week 12	Types of Channels
Week 13	Open Channel Formula
Week 14	Chezy formula
Week 15	Manning formula
Week 16	Preparatory week before the finalExam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Discharge Measurement in Open Channel by Weirs
Week 2	Lab 1: Discharge Measurement in Open Channel by Weirs
Week 3	Lab 2: Friction Factor in Pipes
Week 4	Lab 2: Friction Factor in Pipes
Week 5	Lab 3: Discharge Measurements in Pipes by Venturi Meter
Week 6	Lab 3: Discharge Measurements in Pipes by Venturi Meter
Week 7	Lab 4: Discharge Measurements in Pipes by Orifice Meter
Week 8	Lab 4: Discharge Measurements in Pipes by Orifice Meter

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Fundamentals of Fluid Mechanics, Munson, Okiishi, Huebsch and Rothmayer تجارب في الهيدروليكا ، مؤيد سعدالله	Yes
Recommended Texts	Fluid Mechanics, R. K. Rajput	
Websites		

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Hydrology 2		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☐ Seminar
Module Code			
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	1	Semester of Delivery	1
Administering Department		College	Type College Code
Module Leader	Dr. Ali Zain Alabdeen	e-mail	aalozeer@uomosul.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	PhD
Module Tutor		e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	• Understanding Groundwater Systems: Providing students with a comprehensive understanding of groundwater systems, including their occurrence, distribution, and movement. • Groundwater-Surface Water Interaction: Exploring the relationship between groundwater and surface water, and the processes that govern this interaction. • Groundwater Resources and Management: Studying the importance of groundwater as a vital water resource, including its sustainable management, protection, and restoration. • Hydrogeological Methods: Introducing students to the techniques used in the investigation, evaluation, and modeling of groundwater systems. • Impact of Human Activities: Discussing the impact of human activities on the quality and quantity of groundwater, and the implications for water security and environmental sustainability. • Understanding the Impact of Climate Change on Groundwater: Identifying the most influential climatic factors affecting groundwater.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• Explanation of Groundwater Hydrology Fundamentals: • Understanding the principles of groundwater flow and storage in different types of aquifers. • Describing the hydrological cycle and the role of groundwater within it. • Analyzing Groundwater Systems: • Identifying and classifying different types of aquifers and watersheds. • Evaluating the factors that influence groundwater recharge, discharge, and flow. • Applying Hydrogeological Techniques:

	•Using field and laboratory methods to measure and analyze groundwater properties. •Applying mathematical models to simulate groundwater flow and transport processes. •Assessing Groundwater Quality: •Understanding the sources of groundwater pollution and the processes that affect groundwater quality. •Evaluating the impact of land use, industrial activities, and agricultural practices on groundwater quality. •Proposing Sustainable Groundwater Management Strategies: •Developing strategies for the sustainable management of groundwater resources, considering legal, economic, and environmental aspects. •Evaluating the effectiveness of techniques for restoring contaminated groundwater. •Critically Evaluating Groundwater Policies and Regulations: •Analyzing national and international policies related to groundwater management. • Discussing the challenges facing the implementation of sustainable groundwater management practices in different contexts.
	Guide Content .1Introduction to Groundwater Hydrology: - o Basic concepts of groundwater, aquifers, and water barriers. - o The hydrological cycle and the role of groundwater within it. .2Principles of Groundwater Flow: - o Darcy's Law and principles of groundwater flow. - o Hydraulic conductivity, permeability, and storage capacity. .3Types and Characteristics of Aquifers: - o Confined, unconfined, and suspended aquifers. - o Porosity and permeability of different geological formations. .4Groundwater Recharge and Discharge:

Indicative Contents المحتويات الإرشادية	- o Natural and artificial recharge mechanisms. - o The interaction between groundwater, surface water, and base flow. .5Groundwater Exploration and Monitoring: - o Geophysical methods for groundwater exploration. - o Well logging, groundwater pressure measurements, and groundwater sampling. .6Groundwater Quality and Pollution: - o Sources and types of groundwater pollutants. - o Processes affecting the transport and dispersion of pollutants. .7Groundwater Modeling: - o Introduction to groundwater flow models (e.g., MODFLOW.(- o Pollutant transport modeling. .8Groundwater Management and Sustainability: - o Water rights, allocation, and regulatory frameworks. - o Case studies on sustainable groundwater management. .9Impact of Climate Change on Groundwater: - o Impact of climate change on groundwater recharge and availability. - o Adaptation strategies for groundwater management under climate variability. .10Groundwater Restoration: - o Physical, chemical, and biological methods for groundwater restoration. - o Case studies of successful groundwater remediation projects.
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Delivering lectures that explain the fundamental concepts of groundwater hydrology, such as groundwater flow, types of aquifers, and recharge and drainage processes. •Integrating interactive activities: Using interactive questions, demonstrations, and group discussions to enhance engagement with the material and clarify concepts.

	Practical lessons: •Field training: Organizing field visits to sites of hydrological interest, such as wells, springs, and geological areas, to study aquifers. This helps students apply what they have learned theoretically in a real-world environment. •Laboratory work: Conducting laboratory experiments to measure groundwater properties, such as permeability, porosity, and chemical composition. This contributes to enhancing students' analytical and technical skills. Project-based learning: •Group projects: Dividing students into groups to carry out projects related to groundwater management, such as assessing groundwater quality in a specific area or developing a sustainable groundwater management strategy. These projects encourage collaboration, critical thinking, and the application of knowledge. •Case studies: Studying and analyzing real-world groundwater management cases, enabling students to understand the challenges and potential solutions in different contexts. Software and Simulation Use: •Computer Modeling: Train students to use groundwater modeling software such as MODFLOW to simulate groundwater flow and pollutant transport. This skill is useful for data analysis and informed decision-making. •Ecosystem Simulation: Use simulation tools to understand the complex interactions between groundwater, surface water, and other environmental factors. Problem-Based Learning: •Open-Ended Problems: Present realistic problems or scenarios related to groundwater management and task students with solving them using their acquired knowledge. This type of learning encourages innovation and critical thinking. •Contemporary Issues Discussions: Organize discussions on current issues related to groundwater, such as the impact of climate change on water resources or the challenges of groundwater pollution. Formative and Continuous Assessment: •Quizzes and Discussion Questions: Conduct periodic quizzes and discussion questions during lectures to assess students' understanding and identify concepts that require further emphasis. •Regular Feedback: Provide regular, personalized feedback to students on their progress in projects and lab reports, helping them improve their skills and understanding. Diverse Educational Resources: •Recommended Readings: Students are directed to read scientific articles, reference books, and reports from international organizations to broaden their knowledge and understanding of the subject. •Multimedia: Educational videos, illustrations, and interactive websites are used to explain complex concepts in innovative and engaging ways.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	6, 13	LO #1, 2, 10 and 11
	Assignments	2	5% (5)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	1	20% (20)	Continuous	All
	Report	1	5% (5)	14	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	Introduction to Groundwater
Week 2	• Introduction to groundwater and types of aquifers (confined and unconfined).
Week 3	• Review of the hydrological cycle and the role of groundwater within it.
Week 4	• Overview of the importance of groundwater as a water resource.
Week 5	Hydraulic Properties of Groundwater
Week 6	• Porosity, permeability, and hydraulic conductivity.
Week 7	• Storage capacity of aquifers.
Week 8	• Concepts of water flow in aquifers and interpretation of Darcy's Law.
Week 9	Groundwater Movement and Flow
Week 10	• Principles of groundwater flow, including laminar and turbulent flow.
Week 11	Groundwater Recharge and Discharge • Factors affecting groundwater recharge (precipitation, topography, and soil type). • Methods of measuring and managing recharge. • Natural and artificial groundwater discharge.
Week 12	Groundwater Interaction with Surface Water • The relationship between groundwater and surface water: rivers, lakes, and underground lakes. • Effects of natural and artificial drainage on hydrological systems. • Case studies on the impact of dams and water injection.
Week 13	Groundwater Exploration • Introduction to groundwater exploration methods: drilling, geophysics, and hydrological analysis. • Use of remote sensing techniques and interpretation of geological and hydrological maps. • Groundwater monitoring: methods and tools.
Week 14	Groundwater Quality and Pollution • Natural and human sources of groundwater pollution.

Week 15	General Review
Week 16	Final Examination.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to Laboratory Equipment and Work Safety • Introduction to equipment and instruments used in hydrogeological laboratories. • General laboratory safety guidelines and how to handle chemicals and equipment.
Week 2	Introduction to laboratory samples: how to collect, store, and prepare them.
Week 3	Permeability Measurement Using a Perimeter • Training on using a perimeter to measure permeability in soil and rock samples. • Calculating the permeability coefficient and analyzing the results. • Discussion of factors affecting permeability, such as soil type and particle size distribution.
Week 4	Determining Porosity and Bulk Density • Measuring the porosity and bulk density of soil and rock samples using various techniques, such as the volumetric ratio method. • Analyzing the relationship between porosity and density and their impact on storage properties in water basins. • Comparing porosity results for different geological materials.
Week 5	Groundwater Chemical Composition Analysis • Collection and analysis of groundwater samples to determine their chemical composition (e.g., mineral salts and organic matter). • Use of measuring instruments such as pH meters and conductivity meters to determine water properties.

	• Interpretation of results and evaluation of water quality based on environmental criteria.
Week 6	Using Geophysical Data for Groundwater Exploration • Understanding geophysical techniques such as electrical resistivity and interpreting geophysical data for aquifer exploration. • Analyzing field data and determining the location and depth of groundwater. • Discussing the accuracy of geophysical methods and their applications in exploration.
Week 7	Measuring Groundwater Flow Velocity Using Piezometric Pipes • Training on the installation and measurement of piezometric pipes for groundwater flow velocity. • Analyzing the collected data and calculating water flow in different aquifers. • Discussing the effect of hydraulic properties on groundwater flow.
Week 8	Collecting field samples
Week 9	Data analysis
Week 10	Discussing the findings
Week 11	Pumping Curve Analysis • Conducting pumping experiments and analyzing data to determine aquifer characteristics such as hydraulic conductivity and porosity. • Interpreting pumping curves and using them in groundwater well design. • Discussing the practical applications of pumping curve results in water resources management.
Week 12	Groundwater pollution assessment: Collecting and analyzing samples from contaminated sites to understand the distribution and concentration of pollutants.
Week 13	Evaluating artificial groundwater recharge strategies
Week 14	Groundwater management and strategic storage
Week 15	Research projects and practical applications

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	مبادئ الهيدرولوجي ، (نظير الانصاري، 1979) علم المياه وتطبيقاته، (باقر احمد، 1982) هيدرولوجية المياه الجوفية، (ديفيد توود 1959)، ترجمة رياض حامد الدباغ، وحميد رشيد رفيق "Applied Hydrology" by Ven Te Chow, David R. Maidment, and Larry W. Mays (1988). "Introduction to Hydrology" by Warren Viessman Jr., Gary L. Lewis, and John W. Knapp (2013) "Groundwater Hydrology" by M.A. Todd and L.W. Mays (2004)	Yes
Recommended Texts		No
Websites	• United States Geological Survey (USGS) Water Science School: The USGS Water Science School website offers a wide range of educational resources and information on hydrology, including articles, videos, interactive activities, and data. Visit their website at: https://www.usgs.gov/water-science-school • Hydrologic Engineering Center (HEC): HEC, a part of the US Army Corps of Engineers, provides various resources and software tools for hydrologic engineering and water resources planning. Their website offers technical documentation, publications, and software downloads. Access their website at: https://www.hec.usace.army.mil/ • National Weather Service (NWS): The NWS website provides educational materials and resources on weather and hydrology. They offer information on rainfall, river stages, flood forecasting, and more. Visit their website at: https://www.weather.gov/ • Hydrology Online: Hydrology Online is an educational platform that offers online courses, tutorials, and resources on various aspects of hydrology, including rainfall-runoff modeling, flood forecasting, and watershed management. Explore	

	their website at: https://www.hydrologyonline.com/ Hydrology.org: Hydrology.org is an online portal dedicated to hydrology and water resources. It provides access to articles, publications, research papers, and information on conferences and events related to hydrology. Visit their website at: http://www.hydrology.org/
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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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Computer science		Module Delivery
Module Type	Basic		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	UOM13211		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level		2	
Administering Department		Environmental Technology	College
		environmental science and technology	
Module Leader	Muthaina . A. Mustafa		e-mail
		buthaina@uomosul.edu.iq	
Module Leader's Acad. Title		teacher	Module Leader's Qualification
		M.S.C.	
Module Tutor	Raghad H.Saeed		e-mail
		Raghad.h.alshekh@uomosul.edu.iq	
Peer Reviewer Name			e-mail
Scientific Committee Approval Date		21/06/2023	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- Promote the student's knowledge of computers, its various applications, and its programs, which are used in a variety of fields and the latest technological developments. 2- This course deals with the basics of computers, basic programs in it, viruses and how to eliminate them. 3- How to prepare and operate office programs and services packages and how to use email and the Internet. 4- Promotion of self-education, which enables the teacher to calculate individual differences and eventually improves the quality of learning and teaching, is one of the goals of using technology in the semester and the ability to achieve educational goals that involve skills, such as learning, computer and problem solving. 5- Students are attracted to it because it is an interesting topic. Because it is a fun way to break the student's monotonous memorization and work routine. 6- He frees the teacher from spending time and effort in routine educational tasks, which allows him to allocate more time and energy to design learning situations and experiences that support the intellectual and social growth of students' personalities. Establishing easy -to -adapt programs for students' needs, displaying the scientific subject and identifying students' weaknesses
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- The student will get to know the Internet, their types, and ways to discover and repair breakdowns. 2- The student will learn about the nature and concepts of e-commerce. 3- The student will learn how to discover and fix computer errors. The student will learn about artificial intelligence and its uses in our daily life and current and future applications of artificial intelligence. 4- The student will learn how to discover and fix computer errors. 5- The student will learn about artificial intelligence and its uses in our daily life, the current applications of artificial intelligence, the importance of artificial intelligence in society and future aspirations to use artificial intelligence techniques
Indicative Contents المحتويات الإرشادية	:The guiding content includes the following Networks and their types; Network components. Network security basics. Understanding network threats. Explore and repair network errors. (4 hours) Electronic banking services concepts. (4 hours) Determine and solve the common devices and software problems faced by computer users. (8 hours) Artificial intelligence, artificial intelligence history, artificial intelligence techniques

	and methods, and ethical challenges and considerations. (8 hours) Artificial intelligence in smartphones and virtual assistants such as Siri or Google .Assistant Education, health care, financial, transportation, marketing and advertising. (8 hours) (12) .Education, health care, financial, transportation, marketing and advertising How artificial intelligence affects social relations, artificial intelligence, international relations, artificial intelligence and the future of humanity. (4 hours) Artificial intelligence, privacy and monitoring ethics, and the impact of artificial .intelligence on the labor market Future trends in artificial intelligence, modern research and emerging techniques. (4 hours)
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The development of the computer and the Internet has had a significant impact on educational systems around the world because they are practical tools that can be used to enhance the educational process by continuously diversifying information and its modernity, diversifying the possibilities, developing communication skills in teams, fostering a climate of freedom in the classroom, and utilizing open education in universities. the ability to obtain current research from universities and research centers, the use of the Internet to publicize conferences and educational activities.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	2, 5	LO #1and 4
	Assignments	3	20% (20)	4,7 ,12	LO # 2, 4and 5
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	0	0	0	0
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	

	المفردات المعطاة
Week 1	Security and networking: what is a network? Types of networks. Basic network components
Week 2	Security and networking (Cont.): Network security Basics. Understanding network threats
Week 3	E-commerce: concepts of electronic banking services this include online banking: ATM and debit Card services, phone banking, SMS banking, electronic alert, Mobile banking
Week 4	Computer Troubleshooting: Identifying and solving common hardware and software problems that computer users encounter.
Week 5	Computer Troubleshooting (Cont.): Basic troubleshooting techniques and tools for diagnosing and resolving issues.
Week 6	Introduction to AI: Definition of AI, History of AI, AI Techniques and approaches.
Week 7	Introduction to AI (Cont.) : Key characteristics of AI , Benefits of AI, Challenges and Ethical considerations.
Week 8	The Role of AI in Modern smartphones: AI-Driven Mobile Technologies, Virtual Assistants (Siri , Google Assistant, Alexa).
Week 9	The Role of AI in Modern Smartphones (cont.) : Adaptive Learning , Real-Time Translation Services
Week 10	Applications and Tools of AI : Overview of AI Application in Various Industries, Education and Healthcare .
Week 11	Applications and Tools of AI (Cont.) : Transportation, Marketing and Advertising .
Week 12	Applications and Tools of AI (Cont.) : Finance Robotics and Automation Technologies .
Week 13	AI and Society: How AI affects social, AI and International relations, AI and future of humanity.
Week 14	Ethical Challenges in AI : AI ethics , privacy and surveillance, the impact of AI on the job market.
Week 15	The Future of AI : Future trends in AI, recent research and emerging technologies.

Delivery Plan (Weekly Lab. Syllabus)

المناهج الاسبوعي للمختبر

	Material Covered
Week 1	Using the Open Scholar platform in open access to scientific research, academic data, repositories and other research sources using artificial intelligence techniques using the link https:// openscholar.allen.ai
Week 2	Chat class apps and generative artificial intelligence for scientific texts and paraphrasing: Led by ChatGPT for free from Microsoft office
Week 3	Apply image analysis from, translate and extract texts without having to leave the window using the link https://gemini. Google.com/app
Week 4	Question.AI used to solve mathematical equations and contains calculator and other tools
Week 5	Photo and video processing applications: Occupy this list Midjourney
Week 6	AI typing: Quill Bot chat came Data processing applications
Week 7	Data processing apps: including Hugging Face
Week 8	Gamma Ei does professional presentation
Week 9	Magic school

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	لا يوجد	Yes
Recommended Texts	1. Graham Brown, David Watson, "Cambridge IGCSE Information and Communication Technology", 3rd Edition (2020) 2. Alan Evans, Kendall Martin, Mary Anne Poatsy, "Technology In Action Complete", 16th Edition (2020). 3. Ahmed Banafa, "Introduction to Artificial Intelligence (AI)", 1st Edition (2024).	No

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

	1 - الخضر علي الخضر بحث " أساسيات الحاسوب " 4 2016 الدكتور عادل عبد النور, مدخل إلى عالم الذكاء الاصطناعي " 5 2005	
Websites	https://www.microsoft.com/ar/microsoft-365/powerpoint?market=er1 https://www.xda-developers.com/conditional-formatting-automate-excel-spreadsheet/	

	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Environmental Chemistry 2		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code				
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level		2 (Undergraduate)		Semester of Delivery
Administering Department		Department of Environmental Technologies	College	College of Environmental Science
Module Leader	Assist.Prof.Dr.Eman A.M. Al-jawadi		e-mail	emanaljawadi@uomosul.edu.iq
Module Leader's Acad. Title		Assist.Prof.	Module Leader's Qualification	Ph.D./Chemistry Science
Module Tutor	Dr. Abdul SattarJubairZaben <u>Practical lab lecturer's:</u> Mustafa AmerDhannoon Mohammed SaadallahYounus AbeerSalh		e-mail	Sattarjubair @uomosul.edu.iq
Peer Reviewer Name		ا.م.د.يسرى الشاكر	e-mail	E-mail
Scientific Committee Approval Date		2024	Version Number	1.0

Relation with other Modules

العلاقة مع المواد الدراسية الأخرى

Prerequisite module	Chemistry 1+Chemistry 2+ Environmental Chemistry1	Semester	1
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	The main aim of the course is to equip students with the knowledge of the chemical properties of elements and compounds, as well as about the chemical reactions essential for the emergence and existence of the cycling and accumulation of pollutants in the environment. The course addresses the chemistry of elements and compounds in the atmosphere, water and soil, and lays special emphasis on the processes that define the connections and the dependence between individual segments of environment. This knowledge is essential for the understanding of environmental phenomena, as well as for more specialised studies.
Module Learning Outcomes	Knowledge and understanding: Ability of describing the basic concepts and laws of chemistry both in theory and practice Ability to learn how to analyze and interpret information, and apply it in interdisciplinary and other discipline fields Students learn the basic principles of environmental chemistry (Content Solid-state and Liquid state environmental chemistry, Gaseous-state environmental chemistry, Applied environmental chemistry) . They will be able to apply previous knowledge on analytical chemistry to environmental processes and samples. They will understand the interconnections between different sectors of the environment (soil, water, atmosphere) and the effect of human activities on the natural chemical processes.
مخرجات التعلم	Upon successful completion of this course, students will be able to:

للمادة الدراسية	
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The course Environmental chemistry provides students with basic knowledge useful in other courses, such as in the courses covering topics of atmospheric, water and soil pollution, the course Waste treatment and management, and others.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	65	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	4,7,9,12,15	LO #1 -3,4-6,7-8,19-12and 13-14
	Assignments	2	10% (10)	2, 12	LO # 3, 4, 6 and 7

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Air Pollution
Week 2	Human effect of Air Pollution & it effect on environment
Week 3	Global Warming, Greenhouse Effect, Thinning of the Ozone Layer
Week 4	Photochemical Smog, Acid Rains
Week 5	Radiation pollution
Week 6	Water pollution..1
Week 7	Water pollution...2

	Human effect on Water pollution
Week 8	Soil pollution...1
Week 9	Soil pollution...2
Week 10	Heavy metals pollution
Week 11	Midterm exam
Week 12	Oil pollution...1
Week 13	Oil pollution...2
Week 14	Pollution study case examples..1
Week 15	Pollution study case examples..2
Week 16	Final exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Dissolved oxygen in water
Week 2	Biological oxygen demand (1)
Week 3	Biological oxygen demand (2)
Week 4	Chemical oxygen demand (1)
Week 5	Chemical oxygen demand (2)
Week 6	Calcium ion in water
Week 7	Fluoride in water
Week 8	Measuring carbonates in water

Week 9	Measurement of bicarbonate in water
Week 10	Phosphate ion in water
Week 11	Nitrate ion in water
Week 12	Determination of lead in water
Week 13	Determination of cadmium in water
Week 14	Determination of zinc in water
Week 15	Methods of analyzing results and comparing them with global and local determinants
Week 16	Final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	• C. Baird, Environmental Chemistry, W. H. Freeman and Company, 1998. Catalogue E-version • D. W. Hawker, D. W. Conell, M. Warne, P. D. Vowles: Basic Concepts of Environmental Chemistry, Lewis Publishers, Inc., 1997. E-version	
Recommended Texts	• R. P. Schwarzenbach, P. M. Gschwend, D. M. Imboden: Environmental Organic Chemistry, J. Wiley and Sons, Inc. 1998. Catalogue E-version • G. Howard: Aquatic Environmental Chemistry, Oxford Science Publ., 1998. Catalogue E-version • S. E. Manahan: Environmental Chemistry, Lewis	

	Publishers, Inc., 1994. E-version	
Websites		

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Engineering Analysis		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code				
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	2	Semester of Delivery		2
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	د. تحسين علي حسن جلميران		e-mail	tahssenali1967@uomosul.edu.iq
Module Leader's Acad. Title	مدرس		Module Leader's Qualification	دكتوراه
Module Tutor	Name (if available)		e-mail	E-mail
Peer Reviewer Name	Name		e-mail	E-mail
Scientific Committee Approval Date	05/01/2024		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	

Co-requisites module		Semester	
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Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	.1Develop skills in solving mathematical equations through the application of techniques. .2Learn how to form differential equations. .3Find the degree and order of differential equations. .4Methods for solving first-order and first-order differential equations. .5Applications of first-order and first-order differential equations. .6Methods for solving second-order differential equations. .7Applications of second-order differential equations.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	.1Learn how to form differential equations. .2Learn about methods for solving differential equations. .3Use various methods to solve differential equations based on their properties. .4Describe methods for finding equations and functions using experimental data. .5Discuss methods for obtaining derivative values using experimental data.
Indicative Contents المحتويات الإرشادية	The course content includes: Understanding the concept of differential equations, methods of forming differential equations, methods of solving first-order and second-order differential equations, and methods of solving first-order differential equations with practical examples. [35 hours] Understanding methods of solving second-order differential equations according to the type of function using various methods and techniques with practical examples. [40 hours] Solving simultaneous differential equations with practical examples. [10 hours] Review. [5 hours]

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The main strategy to be followed in delivering this unit is to encourage student participation and interaction with the material throughout the course, while improving, expanding, and developing their thinking skills, and training them in scientific and logical reasoning methods. This will be achieved through the course content, interactive educational programs, and by developing logical methods of scientific thinking for solving mathematical equations.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	35	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative	Quizzes	3	15% (10)	2, 5, 12	LO #1, 2-3 and 5-7

assessment	Assignments	2	15% (10)	2, 4, 11, 12	LO # 1, 3, 5 and 7
	Projects / Lab.				
	Report	1	10% (10)	13	LO # 3, 5 and 8
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Order and degree of differential equations
Week 2	Forming differential equations
Week 3	Solving first-order and first-order differential equations using the separation of variables method
Week 4	Method for solving homogeneous differential equations

Week 5	Method for solving linear differential equations
Week 6	Method for solving perfect differential equations
Week 7	Applications of first-order and first-order differential equations
Week 8	Midterm exam
Week 9	Second-order linear differential equations
Week 10	Ways to find integration 1
Week 11	Ways to find integration 2
Week 12	homogeneous linear differential equations
Week 13	How to change transactions
Week 14	Simultaneous differential equations
Week 15	Applications of second-order differential equations
Week 16	Final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Engineering Mathematics H. K. Dass	Yes
Recommended Texts	Numerical Methods P. Kandasamy and K. Thilagavathy	No
Websites		

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Thermodynamics		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☒ Seminar
Module Code	ENVT321		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3 (Undergraduate)	Semester of Delivery	
Administering Department	Department of Environmental Technologies	College	College of Environmental Science
Module Leader	Assist.Prof.Dr.Eman A.M. Al-jawadi	e-mail	emanaljawadi@uomosul.edu.iq
Module Leader's Acad. Title	Assist.Prof.Dr.	Module Leader's Qualification	Ph.D./Chemistry Science
Module Tutor	Name (if available)	e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Chemistry 1+Chemistry 2	Semester	1+2
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 be able to understand thermodynamic laws and apply these laws to various processes 2. Gain the ability to examine the relationship among changes in energy, work and heat properties. 3. Ability to calculate chemical and physical heat and work requirements 4. Gaining the ability to calculate the efficiency of energy conversion and cooling systems 5. To be able to make thermodynamic analysis of different processes .
Module Learning Outcomes	Determine properties of real substances, such as steam and refrigerant , and ideal gases from either tabular data or equations of state. • Use absolute, gage, and vacuum pressures correctly. • Calculate gage and vacuum pressures using the manometer equation. • Use absolute and Celsius temperatures correctly. determine the thermodynamic properties at that state by using property tables. Apply the ideal gas equation to solve problems involving pressure, temperature, and volume of ideal gases. • Determine changes in internal energy and enthalpy for ideal gases. Analyze systems and control volumes through the application of the second law. • Determine the efficiency of heat engines and compare with the Carnot heat engine efficiency .Apply both the first and second and Third laws to determine heat transfer, work, and property changes during processes occurring in both closed and open systems. Thermodynamic property relations .Maxwell relations, Clapeyron equation, Joule-Thomson coefficient .Thermodynamics of Ideal Gas Mixtures and Separation
مخرجات التعلم للمادة الدراسية	Upon successful completion of this course, students will be able to: 1. Students will be able to apply thermodynamic laws to variety of thermo Chemical problems. Contribution to Program Outcomes 1. Acquire the necessary knowledge to successfully execute the profession of Chemical . 2. Design a complex system, process, device, or product to meet specific requirements under realistic constraints and conditions; they implement modern design methods for this purpose. Method of assessment 3. Written exam 2. By examining ideal gas and true gas behavior, students will be able to establish pressure, volume, and temperature relationships for pure substances and mixtures. Contribution to Program Outcomes 1. Acquire the necessary knowledge to successfully execute the profession of Thermo Chemical 2. Design a complex system, process, device, or product to meet specific requirements under realistic constraints and conditions; they implement modern design methods for this purpose.

	3. Understand the social and global importance of proposed solutions. Method of assessment 4. Written exam 3. Students will be able to calculate the heat and work requirements of chemical processes. Contribution to Program Outcomes 1. Acquire the necessary knowledge to successfully execute the profession of Thermo Chemical 2. Work in disciplinary and multidisciplinary teams or individually. 3. Have knowledge about the effects of Thermo Chemical applications on health, environment and security in universal and social dimensions and the problems of the age. Method of assessment 4. Written exam 4. Students will be able to apply the second and third laws of thermodynamics to various thermo Chemical problems Contribution to Program Outcomes 1. Acquire the necessary knowledge to successfully execute the profession of Thermo Chemical 2. Select and use the modern techniques and tools necessary for Thermo Chemical applications; use effectively information technologies, and at least one computer software. Method of assessment 3. Written exam 5. Students will be able to conduct a thermodynamic analysis of heat-generating systems by examining the relationship between work and heat. Contribution to Program Outcomes 1. Acquire the necessary knowledge to successfully execute the profession of Thermo Chemical, Third laws to determine heat transfer, work, and property changes during processes occurring in both closed and open systems. 2. Have sufficient knowledge about mathematics, science and Thermo Chemical. 3. Design a complex system, process, device, or product to meet specific requirements under realistic constraints and conditions; they implement modern design methods for this purpose. Method of assessment 4. Written exam 6. Students will be able to make thermodynamic analyzes of cooling systems. Contribution to Program Outcomes 1. Acquire the necessary knowledge to successfully execute the profession of Thermo Chemical
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	,Thermodynamic property relations .Maxwell relations, Clapeyron equation, Joule-Thomson coefficient .Thermodynamics of Ideal Gas Mixtures and Separation 2. Work in disciplinary and multidisciplinary teams or individually. 3. Understand the social and global importance of proposed solutions. Method of assessment 4. Written exam
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The objective of this course is to learn about Concept temperature; the heat and basic theories in deriving the general law of gases,Thermodynamic system (closed, open, or controlled the sound); Thermodynamic and equilibrium properties. System Status, Status Diagram,Path and process different working methods of the zero law of thermodynamics; familiarity with the three public sector in Thermodynamics
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	40	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation

تقييم المادة الدراسية

	Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
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Formative assessment	Quizzes	2	10% (10)	3,5,8,12,14	LO #1, 2,3-4,5-7,8-11,12 and 13
	Assignments	2	6% (6)	2, 12	LO # 3, 4, 6 and 7
	Seminar	1	4% (4)	Continuous	All
	Report	1	10% (10)	13	LO # 5, 8 and 10
Summative assessment	Midterm Exam	3 hr	10% (10)	9	LO # 1-8
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المناهج الاسبوعي النظري

	Material Covered
Week 1	Introduction and basic concepts. The scope of thermodynamics. Energy forms, Gases Law & application .
Week 2	DEFINITIONS OF THERMODYNAMIC TERMS a. Heat (Conduction, convection and radiation heat transfer) b. Internal Energy c. Reversible and actual Work
Week 3	d. Pressure and temperature e. Specific heat; C_p , C_v and specific heat ratio, k f. Properties of State: quality, enthalpy, entropy, specific volume. Quiz
Week 4	Properties of pure substances. Thermodynamic properties and state functions. Applied processes for the ideal gas. (constant volume, constant pressure, isothermal, adiabatic, polytropic).
Week 5	The zeroth and the first law of thermodynamics. Energy transformations. Internal energy. 1 st law of thermodynamics a. Closed mass analysis 1. Constant volume process 2. Constant pressure process 3. Constant temperature process 4. Adiabatic process 5. Polytropic process Quiz
Week 6	Energy balance for closed and open systems. Enthalpy. Equilibrium, phase rule, reversible process, heat capacity and specific heat
Week 7	Heat effects (sensible heat, latent heat), standard reaction temperature, standard formation temperature, standard combustion temperature.
Week 8	The second law of thermodynamics and entropy. The mathematical expression of the second law. Heat and Cooling Machines. The Carnot cycle. Quiz
Week 9	Midterm exam

Week 10	Heat Stored during Phase Changes ,Gibbs Free Energy
Week 11	Complete.....Applications of closed mass to heat engines such as 1. Diesel cycle 2. Otto cycle 3. Carnot cycles Second law of thermodynamics a. Entropy and the second law 1. Clausius inequality 2. Clausius and kelvin statement of second law 3. Entropy equation b. Concepts of availability energy and second law efficiency
Week 12	The third law of thermodynamics and absolute entropy . . Quiz
Week 13	CompleteEntropy Change of Pure Substance, Isentropic Processes Property Diagrams Involving Entropy, What Is Entropy T ds Relations, Entropy Change of Liquids and Solids . Entropy change of Ideal Gase
Week 14	Thermodynamic property relations . Maxwell relations, Clapeyron equation, Joule-Thomson coefficient . Thermodynamics of Ideal Gas Mixtures and Separation. Quiz
Week 15	Final exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1. P. Atkins and J. de Paula. Chimica Fisica. Zanichelli, Bologna, 5th edition, 2012 2.K. Denbigh. I principi dell'equilibrio chimico. Ed. Ambrosiana, Milano, 2 nd edition, 1977 3. R.G. Mortimer. Physical Chemistry. Academic Press, S.Diego, 2nd edition, 2000	
Recommended Texts	1. Daniel V. Schroeder. An Introduction To Thermal Physics. Addison Welsey Longman, 2000 2.Modell M., Reid R.C., Thermodynamics and Its Applications, Prentice-Hal,1983. (ISBN: 97801391501) 3.Sandler, S.I., Chemical, Biochemical and Engineering Thermodynamics, 4th Ed., John Wiley & Sons Inc., 2006. (ISBN: 9780471661740)	

Websites	
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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
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MODULE DESCRIPTION FORM

Module Information			
معلومات المادة الدراسية			
Module Title	Air pollution		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☒ Seminar
Module Code	ENVT329		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	1
Administering Department	Environmental Technology	College	Environmental Science
Module Leader	Mohammed Fakhraldeen Ahmed	e-mail	milhebi@uomosul.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	MSc.
Module Tutor	Hamsa Burhan Mohammed	e-mail	hamsaalbazaz@uomosul.edu.iq
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	/ / 2025	Version Number	1.0

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	1 . Identify the most common air pollutants, the damage they cause, and how to treat them. 2. Identify the available treatment methods to reduce air pollutant emissions, their efficiency, and their design. 3. Identify indoor air pollutants and how to treat them. 4. Identify gaseous pollutants emitted by vehicles and how to reduce them. 5. Identify how to take samples from chimneys and calculate the concentration and types of air pollutants. 6. Provide the student with cognitive skills related to sound, its sources, types, and the factors that affect it. 7. Identify noise, its sources, sound pressure, and noise pollution measuring devices.
Module Learning Outcomes	1 . Enabling the student to identify the gases that cause air pollution. 2. Explaining most of the terms related to gaseous pollutants. 3. Familiarizing the student with how to treat gaseous pollutants, the devices used to treat them, and the advantages and disadvantages of each device. 4. Familiarizing the student with gaseous pollutants inside the classroom and providing a detailed explanation of how to reduce radon gas, with examples. 5. Explaining the gaseous pollutants emitted from gasoline and diesel engines and how to reduce these pollutants. 6. Enabling the student to calculate the discharge from chimneys and the devices used to measure gas concentrations at the source. 7. Enabling the student to understand wave motion, sound frequency, sound quality, and pitch. 8. Enabling the student to understand noise pollution, its negative effects, measuring devices, and methods for controlling it.
Indicative Contents	Chapter One: Introduction, sources of air pollution, types of pollutants, classification of gaseous pollutants, determinants of air quality, conversion of weight and volume units with explanation and examples, strip collector, air pollution index, major gaseous pollutants in the atmosphere (nitrogen oxides, sulfur oxides, ozone, and carbon monoxide) (14 hours)

Chapter Two: Gravity precipitators, finding the efficiency of a gravity precipitator and calculating the smallest particulate matter that can be removed, cyclones, calculating the smallest particulate matter that can be removed by cyclones, calculating the pressure difference in a cyclone, multiple cyclones, connecting cyclones in series and parallel, types of filters, advantages and disadvantages of using filters, types of filter media, electrostatic precipitators, applications of the Deutig equation to find the efficiency of electrostatic precipitators, wet precipitators and their types (20 hours)

Chapter Three: Control of gaseous pollutants from mobile sources, reduction methods Pollutants emitted from tires, the effect of mixing ratios on the production of gaseous pollutants, alternative fuels, fuel cells (4 hours)

Chapter Four: Transmission of air pollutants to the atmosphere, wind flower, the effect of terrain on smoke movement, smoke cloud movement patterns, depth of the mixing zone, venting coefficient, mathematical representation of the diffusion of gaseous pollutants, the Gaussian equation (6 hours)

Chapter Five: Techniques for taking air samples from the chimney, locations for taking samples from the chimney, determining the components of the exhaust gases, calculating the velocity of the exhaust gases from the chimney, solving examples (10 hours)

Chapter Six: Wave motion and its types, sound, its sources and speed, the response of the human ear to sound, sound frequency, sound intensity, factors on which sound intensity depends, basic factors for sound generation and propagation, pitch, sound quality (4 hours)

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

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	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	15%	3, 12	LO #1, 2 and 5
	Assignments	2	15%	6, 12	LO # 2, 3and 6
	Projects / Lab.				
	Report	1	10% (10)	13	LO # 5 and 6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in the delivery of this unit is to encourage students to participate in the exercises, while improving and expanding their critical thinking skills at the same time. This will be achieved through classes and interactive tutorials and by thinking about the type of simple experiments that include some sampling activities that are of interest to the students.

	Material Covered
Week 1	Definition, sources of air pollution, types and classes of air pollutants, conversion of volumetric concentration to weight, coefficient of Haze COH, measuring instruments, sampler strip collector
Week 2	Impact coefficient, probability level, risk level, effective weight, air pollution index. An overview of the main air pollutants.
Week 3	Sulfur oxides, carbon monoxide, nitrogen oxides. Rinkelmann table, optical measuring devices. QUIZ
Week 4	Particles, a definition of the terminology used for particulate matter, methods of treating gaseous pollutants. Gravity sedimentation chambers, derivation of Stock's law. Calculate the smallest particle that can be removed by gravity precipitators.
Week 5	Inertia separators, dust catchers, wet precipitators.
Week 6	Cyclones, calculating the smallest diameter that can be removed with a cyclone, calculating the pressure difference, types of cyclone inlets, multiple cyclones, filters, types, factors affecting filtration efficiency. Electrostatic precipitators, principle of operation, efficiency of precipitators.
Week 7	Middle examination
Week 8	Filters, their types, factors affecting filtration efficiency. Electrostatic precipitators, precipitator efficiency.
Week 9	Methods for treating gaseous pollutants from fixed and mobile sources. Techniques for reducing concentrations from mobile sources. Alternatives to internal combustion engines..
Week 10	Airborne pollutant transfer, atmospheric factors and ground conditions affecting the movement of gaseous pollutants,
Week 11	environmental decline rate, rising smoke behavior and types, mixing zone, venting coefficient, anemometer s, QUIZ
Week 12	Indoor air quality, radon gas, treatments used to reduce the effect of radon gas, examples solution.
Week 13	Chimney sampling techniques, determining the quality and velocity of exhaust gases, and solving examples of wave motion,
Week 14	sound frequency, sound quality, and pitch.
Week 15	Noise pollution, its negative effects, measuring devices, and control methods.
Week 16	Preparatory week before the final Exam

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

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Introduction to environmental engineering and sciences/CHAP.7 & 8 Author/ Gilbert M. masters Stanford university ISBN 0-13-155384	No
Recommended Texts		No
Websites		

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Measurement Technologies		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☒ Seminar	
Module Code	ENVT325			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	3	Semester of Delivery		1
Administering Department	ENV.TECH	College	Type College Code	
Module Leader	Dr.Ali Basheer		e-mail	alibasheer@uomosul.edu.iq
Module Leader's Acad. Title		Module Leader's Qualification		
Module Tutor	Hamsa Burhan Mohammed		e-mail	hamsaalbazaz@uomosul.edu.iq
Peer Reviewer Name	Name	e-mail	E-mail	
Scientific Committee Approval Date	1/06/2024	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	• To teach students the method of using laboratory equipment techniques. • To recognize the measuring devices used in practical scientific research. • To understand how to calculate measurement errors and analyze practical results scientifically and objectively. • To recognize atomic and molecular spectra and the devices used in spectral analysis and their principles of operation. • To understand radiation measuring devices, their components, and their principles of operation.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. To learn the laws related to finding the error ratio and some statistical analysis laws and to solve mathematical problems. To recognize some types of measuring techniques and the differences between them. 2. To understand the electromagnetic spectrum and the types of electromagnetic waves from the highest frequency to the lowest, distinguishing between waves emitted from atoms and those emitted from the nucleus, and to understand absorption and emission spectra for some atoms due to the importance of these spectra in testing certain elements and samples. 3. To gain detailed knowledge about X-rays, their properties, and uses, and to understand X-ray spectroscopy and its importance in determining the crystalline structure of solid materials and the distance between atoms in crystal planes. 4. To recognize radiation detection devices regarding the effectiveness of each device for different types of radiation, their structure, and how they operate. To understand radiation doses, their types, and the units used to measure these doses. 5. To know the components of a UV-visible spectrophotometer and how it works, as well as the types of materials that can be tested with this spectrophotometer. 6. To understand the principle of operation of the electron microscope, the differences between it and the optical microscope, its components, and types.

Indicative Contents المحتويات الإرشادية	Introductory lecture to the subject – Measurement – Fundamental and derived units – Multiples and submultiples of units (2h) Types of measurements – Range – Definition of error and its types – Accuracy – Precision – Sensitivity – Laws related to measurement errors – Measurement accuracy – Percentage accuracy – Solving numerical examples – Arithmetic mean – Deviation – Standard deviation – Mean deviation and solving examples – Types of measurement technologies (12h) Electromagnetic spectrum and its sections – Atomic spectrum – Absorption and emission spectra – Hydrogen atom emission spectrum – Molecular spectrum – Phosphorescence and fluorescence (10h) Absorption of ionizing radiation – Linear absorption coefficient – Mass absorption coefficient – Half-value thickness – Solving questions (6h) Interaction of radiation with matter – Photoelectric effect – Compton effect – Pair production phenomenon – X-rays – X-ray production – X-ray spectrum (12h) Properties of X-rays – Their hazards and uses – Applications of X-rays on crystals – X-ray diffraction and Bragg’s Law – Solving questions – Radiation survey instruments and dose measurement – Types of radiation survey instruments (10h) Personal dosimetry devices – Radioactive contamination monitoring instruments – Units of radiation dose measurement – Biological effect – Radiation weighting factor – Equivalent tissue dose – Solving a question – Units of radiation dose measurement – Biological effect – Radiation weighting factor – Equivalent tissue dose – Solving a question – Tissue weighting factor – Effective dose (12h) UV-Visible spectrophotometer – Electron microscope – General review (8h)
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Using various visual aids through the data show projector in classrooms, along with models of devices used in practical measurements and laboratory instruments and equipment, as well as utilizing the whiteboard for solving and explaining mathematical problems. Encouraging open discussion among students and active participation of the instructor in explaining and discussing the material during the lecture to create an atmosphere of mental engagement and brainstorming, and to reinforce the concepts of the scientific material in a manner that aligns with the academic level of the students.
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Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	75	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	25	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	20% (20)	3, 12	LO #1, 2, 3 and 4
	In-assignments	1	5% (5)	2,3,5	LO # 1, 2, and 3
	Out-assignments	1	5% (5)	2,3, 5	LO # 1, 2, and 3

	Seminar	1	10% (10)	13	LO # 2-6
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introductory lecture to the subject – Measurement – Fundamental and derived units – Multiples and submultiples of units – Types of measurements
Week 2	Range – Definition of error and its types – Accuracy – Precision – Sensitivity – Laws related to measurement errors – Measurement accuracy – Percentage accuracy – Solving numerical examples
Week 3	Arithmetic mean – Deviation – Standard deviation – Mean deviation and solving examples – Types of measurement technologies – Quiz
Week 4	Electromagnetic spectrum and its sections – Atomic spectrum – Absorption and emission spectra – Hydrogen atom emission spectrum
Week 5	Molecular spectrum – Phosphorescence and fluorescence – Absorption of ionizing radiation – Linear absorption coefficient – Mass absorption coefficient – Half-value thickness – Solving questions
Week 6	Interaction of radiation with matter – Photoelectric effect – Compton effect – Pair production – X-rays – X-ray production – X-ray spectrum
Week 7	Properties of X-rays – Their hazards and uses – Applications of X-rays on crystals – X-ray diffraction and Bragg's Law – Solving questions
Week 8	Radiation survey instruments and dose measurement – Types of radiation survey instruments
Week 9	Personal dosimetry devices – Radioactive contamination monitoring instruments
Week 10	Units of radiation dose measurement – Biological effect – Radiation weighting factor
Week 11	Equivalent tissue dose – Solving a question – Tissue weighting factor

Week 12	Effective dose – Quiz
Week 13	UV-Visible spectrophotometer
Week 14	Electron microscope
Week 15	General review
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Measurements and Instruments \ Introduction to Electrical and Electronic Measurements	No
Recommended Texts	Radiation Protection \ Dr. Mustafa Mohammed Abdul-Mahdi	No
Websites	https://ar.wikipedia.org/wiki https://solarabic.com/learn/2019/06/concepts-of-testing-measurement-technologies/	

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	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
(0 – 49)	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.

MODULE DESCRIPTION FORM

Module Information			
معلومات المادة الدراسية			
Module Title	Occupational safety and health		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	ENVT 324		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	3	Semester of Delivery	
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Diana nooraldinmustafa Abdulla abidalsttarthannon Hananreyadjarallah		e-mail E-mail diasbio86@uomosul.iq E-mail abdulla84@uomosul.edu.iq E-mail hananjarallah@uomosul.edu.iq
Module Leader's Acad. Title	مدرس	Module Leader's Qualification	
Module Tutor		e-mail	E-mail
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	30/06/2025	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	1. The chemicals and biological laboratories should have safety and security in high companies laboratories to control risks inside laboratories like fires by gas or by chemicals and biological factors caused diseases which may be transmitted from workers to community and caused epidemic and diseases .
Module Learning Outcomes	Identify toxic and dangerous chemicals and explosive , learn the ways for dealing and saving them 2- identify disease caused and learn ways for dealing with them and saving them safety 3- learn how to prevent risks and how to deal with them 4- learn first aid to keep lives of workers in laboratories .
Indicative Contents	Indicative content includes the following. Introduction about health and safety and put basic properties of laboratories under rules of safety (7h) safety signals and precautions safety when saving chemicals and types of risks (10h) mid term exam (2h) saving biological samples and removing contamination (7h) fires inside laboratories and first aid (12h) rules of general safety inside laboratories (7h) final exam (3h) .

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Application safety inside chemical and biological laboratories and prevent risks by foccus on safety building for laboratories , good devices and training workers in laboratories for safety dealing with pathogenic germs and chemicals and how to deal them safety .
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem)		Structured SWL (h/w)	
Unstructured SWL (h/sem)		Unstructured SWL (h/w)	
Total SWL (h/sem)	50 h		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20% (20)	3 ; 6 ; 10 ; 14	LO #1, 2, 3 and 4
	Assignments	1	10% (10)		
	Projects / Lab.				
	Report	1	10% (10)		
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
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Week 1	Itroduction about occupational safety and health
Week 2	Rules of occupational safety inside laboratories
Week 3	Laboratory safety signals
Week 4	Precautions safety when saving chemicals
Week 5	Types of risks in chemical laboratories 1
Week 6	Types of risks in chemical laboratories 2
Week 7	midterm
Week 8	Deal with biological samples and saving them safety in biological laboratories
Week 9	Remove contamination , waste management to control risks inside biological laboratories
Week 10	Fires inside laboratories and the ways to prevent them
Week 11	First aid 1
Week 12	First aid 2
Week 13	Rules of general safety inside labrotaries
Week 14	Emergency response
Week 15	Review
Week 16	Final exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1:
Week 2	
Week 3	

Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	WHO Laboratory Biosafety manual , 4 th edition 2023	Yes
Recommended Texts	The manual for occupational health and safety by hashem al araji	No
Websites	https://www. Eco.mu.edu.iq	

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Remote sensing		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☒ Seminar
Module Code	ENVT320		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Abdalrahman R. Qubaa	e-mail	abdqubaa@uomosul.edu.iq
Module Leader's Acad. Title	Asst. Prof.	Module Leader's Qualification	Ph.D.
Module Tutor	Name Asmaamoayadsaadallah	e-mail	E-mail asmaa.m@uomosul.edu.iq
Peer Reviewer Name		e-mail	E-mail
Scientific Committee Approval Date	30/06/2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module		Semester	
Co-requisites module	Geographic Information Systems (GIS)	Semester	5

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. to provide an overview of the physical principles of remote sensing. 2. Introduce the student to the processing of remotely sensed data and the development of applications for Earth's resources management and monitoring 3. to develop specific skills in the use of spatial analysis and remote sensing software used in Geographical research. 4. how an understanding of all these can be applied to a range of environmental applications..
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	By the end of the module the student should be able to: 1. Define and explain the key concepts and terminology used in remote sensing 2. Describe the electromagnetic spectrum and appreciate some of the fundamental physical properties of radiation and their suitability for use in remote sensing 3. Summaries and discuss the interactions of radiation in visible to microwave wavelengths with the terrestrial environment, and with vegetation, soils and water in particular. 4. List and discuss the advantageous features of remote sensing for the study of the Earth's environment 5. Analyse and interpret remotely sensed data. 6. Explain how thematic maps may be derived from remotely sensed data. 7. Conduct laboratory based analyses of remotely sensed and satellite data 8. Describe the properties of some major remote sensing systems. 9. Appreciate some of the ways remote sensing may be used in the study of the Earth's environment
Indicative Contents المحتويات الإرشادية	Through attending the lectures and practical sessions and through completing the assessments, you will work towards developing graduate attributes in GIS, spatial analysis, remote sensing, literacy and analytical skills

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	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.
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Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	100	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6,6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	25	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	1,6
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1	30% (30)	5,8, 10,11,14	LO #1, 2, 3,4,7 and 8
	Assignments	1	2% (2)	2, 12	LO # 4 and 5
	Projects / Lab.	1	3% (3)	Continuous	All
	Seminar	1	5% (5)	13	
Summative	Midterm Exam	2 hr	10% (10)	7	LO # 1-6

assessment	Final Exam	3hr	50% (50)	16	All1-9
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Remote Sensing: History, Fundamentals.
Week 2	The main advantages of remote sensing science and technology: data acquisition, data analysis, and reference data
Week 3	The Electromagnetic Spectrum
Week 4	Energy Interactions with the Atmosphere
Week 5	Definition of Aerial Photographs: Their Types, Advantages, Disadvantages, Interpretation Keys, and a Daily Quiz
Week 6	Fundamentals of Aerial and Satellite Image Interpretation+ Satellite Sensors and Platforms
Week 7	Midterm Exam
Week 8	Spatial, Spectral, Radiometric, and Temporal Resolution of Satellite Images
Week 9	Spectral Signature of Terrestrial Targets
Week 10	Introduction to Unmanned Aerial Vehicles (Drones) in Remote Sensing + Daily Quiz
Week 11	Satellites (LANDSAT Satellite Program)
Week 12	SPOT Satellite Program
Week 13	SENTIAL Satellite Program
Week 14	Satellite Image Processing
Week 15	Review
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: :A general introduction to the types and names of remote sensing software.
Week 2	Lab 2:: Installing the ERDAS program.
Week 3	Lab 3: : Definition of the ERDAS program interface
Week 4	Lab 4: :Vertical menus in the ERDAS program
Week 5	Lab 4: :Vertical menus in the ERDAS program
Week 6	Lab 6, : Home menu,File menu
Week 7	Lab 7:Manage Data Menu
Week 8	Lab 8:Monitoring Students' Skills in Using Menus and Applications + Daily Quiz
Week 9	Lab 9:: Raster Menu and Vector Menu
Week 10	Lab 6: : Terrain Menuand Toolbox Menu in the Program
Week 11	Lab 6: : Daily Quiz
Week 12	Lab 6:Image rectification and restoration using ERDAS
Week 13	Lab 6:Linear and Non-Linear Image Enhancement Using ERDAS+ Spatial and Spectral Image Enhancement Using ERDAS
Week 14	Lab 6:Image classification using ERDAS
Week 15	Lab 6:Review
Week 16	Lab 6: :Fainl exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?

Required Texts	BOOK: Remote sensing and image interpretation Lillesand, Thomas M.; Kiefer, Ralph W.; Chipman, Jonathan W. 6th ed Chichester John Wiley [distributor]c, 2008.	NO
Recommended Texts	BOOK: Introduction to the physics and techniques of remote sensing , Elachi, Charles; Van Zyl, Jakob 2nd ed Hoboken, N.J. Wiley-Interscience Wiley series in remote sensing, 2006	No
Websites	Indicative learning resources - Web based and electronic resources	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Solid waste management and treatment		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	ENVT323		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester of Delivery	1
Administering Department	Environmental Technology	College	Environmental sciences
Module Leader	Mohammed fakhraldeen	e-mail	milhebi@uomosul.edu.iq
Module Leader's Acad. Title	assistant professor	Module Leader's Qualification	master
Module Tutor	Omar khairalden	e-mail	Omar.k.aldeen@uomosul.edu.iq
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date		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	The unit aims to manage and treat solid waste in general and focuses on the following objectives: Understanding Solid Waste: The unit aims to provide a comprehensive understanding of solid waste, including its types, sources, composition, and characteristics. This knowledge helps determine appropriate management and treatment strategies. Waste Generation and Collection: The unit aims to explore the factors that affect the generation of waste and methods of its collection. It covers topics such as waste generation rates, population growth, waste sorting, and collection techniques. Waste Reduction and Recycling: The module focuses on strategies to reduce waste generation and promote recycling. It discusses technologies such as waste reduction at source, material reuse, and recycling programs. The goal is to encourage sustainable practices and reduce the burden on landfills. Waste Treatment Technologies: The unit aims to introduce the different waste treatment technologies available for solid waste management. It covers traditional methods such as landfilling, incineration, and composting, as well as advanced techniques such as anaerobic digestion, pyrolysis, and gasification. The goal is to understand the advantages, limitations and environmental impacts of each technology. Environmental and Health Effects: The unit aims to highlight the environmental and health risks associated with improper waste management. It discusses topics such as air and water pollution, soil pollution, greenhouse gas emissions, and potential health risks for communities living near waste disposal sites. Understanding these impacts is critical to designing effective waste management systems
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The module on management and treatment of solid waste aims to equip learners with a comprehensive understanding of the subject. By the end of the module, learners should be able to: 1. Define and explain the concept of solid waste management: Understand the definition, scope, and significance of solid waste management in the context of environmental sustainability and public health. 2. Identify different types of solid waste: Recognize and categorize various types of solid waste, including municipal solid waste, hazardous waste, electronic waste, construction and demolition waste, and industrial waste. 3. Analyze the environmental and health impacts of solid waste: Evaluate the potential environmental and health hazards associated with improper solid waste management, including pollution of air, water, and soil, greenhouse gas emissions, and the spread of diseases. 4. Describe the principles of waste reduction and source separation: Understand the importance of waste reduction strategies, such as waste prevention, recycling, and composting, and explain the concept of source separation for effective waste management. 5. Assess waste collection and transportation methods: Evaluate different waste collection systems, including curbside collection, community bins, and drop-off centers, and analyze transportation methods for efficient and cost-effective waste management. 6. Examine waste treatment technologies: Explore various waste treatment technologies, such as recycling, composting, waste-to-energy conversion, incineration, and landfilling. Understand their processes, benefits, limitations, and environmental implications. 7. Evaluate the role of policy and regulations in waste management: Understand the

	importance of waste management policies, regulations, and standards at local, national, and international levels. Assess their impact on waste management practices and compliance. 8. Analyze case studies and best practices in waste management: Study real-world examples and best practices in solid waste management from different regions and sectors. Analyze their success factors, challenges, and potential for replication. 9. Develop waste management strategies and plans: Apply knowledge gained to develop effective waste management strategies and plans, considering factors such as waste characterization, waste hierarchy, stakeholder engagement, and sustainable practices. 10. Promote public awareness and community engagement: Recognize the importance of public education and community engagement in promoting responsible waste management behaviors. Develop strategies for raising public awareness and encouraging community participation. 11. Consider socio-economic aspects of waste management: Understand the social and economic dimensions of waste management, including waste management costs, financing mechanisms, job creation, and opportunities for the informal waste sector. 12. Critically analyze emerging trends and innovations in waste management: Stay updated with emerging trends, technologies, and innovations in the field of solid waste management, such as circular economy approaches, smart waste management systems, and sustainable packaging solutions.
Indicative Contents المحتويات الإرشادية	The indicative contents of a unit on solid waste management and treatment include the following topics: Chapter one: (15 hours) Introduction to solid waste management and definition of solid waste and its types The importance of solid waste management Waste generation and characterization Factors affecting waste generation rates Waste composition analysis and characterization Trends and patterns in waste generation Waste collection and transportation Chapter two: (15 hours) Collection systems and methods Transfer stations and waste transportation logistics Collection efficiency and improvement techniques

	Waste sorting and source separation The importance of sorting waste and separating the source Source separation methods and practices Benefits and challenges of waste management separated from the source Chapter three: (15 hours) <i>recycling technologies</i> <i>Recycling and resource recovery</i> <i>Recycle certain materials (paper, plastic, glass, metals)</i> <i>Recycling of demolition and construction waste</i> Chapter Four: (15 hours) <i>Composting and organic waste management</i> <i>Fertilization process and techniques</i> <i>Compost Types (Aerobic, Anaerobic)</i> <i>Benefits and applications of fertilization</i> Chapter Five: (15 hours) <i>waste-to-energy technologies</i> <i>Methods for converting waste into energy</i> <i>Energy recovery from waste and electricity generation</i> Chapter Six: (15 hours) <i>Sanitary landfill</i> <i>Its types</i> <i>Sanitary landfill methods and processes</i> <i>Estimating the amount of gases produced in the sanitary landfill site</i>
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	When designing a module on solid waste management and treatment, a combination

of effective learning and teaching strategies can enhance student engagement and understanding of the subject matter. Here are some learning and teaching strategies that can be employed:

1. **Lectures:** Traditional lectures can provide an overview of key concepts, theories, and principles related to solid waste management and treatment. Presentations can be supported with visual aids, case studies, and real-life examples to enhance understanding.
2. **Group Discussions and Debates:** Encourage students to engage in group discussions and debates on specific topics or case studies related to waste management. This strategy promotes critical thinking, problem-solving skills, and the ability to analyze different perspectives.
3. **Case Studies and Real-Life Examples:** Integrate case studies and real-life examples from different regions and sectors to illustrate the practical applications of waste management principles. This approach helps students relate theoretical knowledge to real-world scenarios.
4. **Field Visits and Guest Lectures:** Organize field visits to waste management facilities, recycling centers, or waste treatment plants to provide students with hands-on experience and practical insights. Inviting guest lecturers from the waste management industry or regulatory agencies can also offer diverse perspectives and industry expertise.
5. **Problem-Based Learning:** Present students with real or hypothetical waste management challenges and ask them to develop solutions and action plans. This approach promotes problem-solving skills, critical thinking, and teamwork.
6. **Interactive Workshops and Demonstrations:** Conduct interactive workshops and demonstrations to familiarize students with waste management technologies, such as composting or recycling processes. Hands-on activities can enhance practical understanding and skills development.
7. **Role-Playing and Simulations:** Engage students in role-playing exercises or simulations that mimic waste management scenarios. This strategy helps students understand the complexities and decision-making involved in waste management practices.
8. **Online Resources and Multimedia:** Utilize online resources, multimedia materials, and interactive tools to supplement classroom learning. Online platforms can provide additional readings, videos, quizzes, and discussion forums for students to access and engage with outside of class.
9. **Group Projects and Presentations:** Assign group projects where students can investigate specific waste management topics or develop waste management plans for a given scenario. Students can present their findings, recommendations, and outcomes to the class, fostering teamwork and communication skills.
10. **Assessments and Feedback:** Implement a variety of assessment methods, including quizzes, exams, assignments, and presentations, to evaluate students' understanding of the subject matter. Provide timely and constructive feedback to help students improve their knowledge and skills.
11. **Reflective Journals and Self-Assessment:** Encourage students to maintain reflective journals or engage in self-assessment exercises where they can critically reflect on their learning, challenges faced, and areas for

	improvement. 12. Guest Speakers and Panel Discussions: Invite experts, practitioners, or researchers in the field of solid waste management to deliver guest lectures or participate in panel discussions. This allows students to gain insights from professionals working in the industry. 13. Online Discussion Boards and Collaboration Tools: Use online discussion boards and collaboration tools to facilitate ongoing discussions, peer-to-peer learning, and knowledge sharing among students. This encourages active participation and engagement outside the classroom. 14. Reflective and Experiential Learning: Incorporate reflective and experiential learning activities, such as journaling, field observations, and critical reflection exercises, to deepen students' understanding and encourage self-directed learning. 15. Community Engagement and Service Learning: Foster community engagement by involving students in service-learning projects related to waste management. Collaborate with local organizations or municipalities to provide opportunities for students to apply their knowledge and contribute to real-world waste management initiatives.
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Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	75	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	25	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative	Quizzes	2	10% (10)	5, 10	LO #1, 2, 10 and 12

assessment	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 principles of waste management
Week 2	Physical and chemical methods for the test of waste
Week 3	waste generation rate
Week 4	store the waste
Week 5	collection the waste
Week 6	collection cost
Week 7	Waste transport wheels and intermediate stations
Week 8	compost
Week 9	Solid waste treatment technology
Week 10	Aerobic, anaerobic and combined burn
Week 11	waste recycle
Week 12	Sanitary landfill
Week 13	hazardous waste
Week 14	Energy recovery from burning

Week 15	Special waste such as medical waste, demolition and construction waste
Week 16	A preparatory week before the final exam

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	- Introduction to environmental engineering and science / Gelbert M. Masters	Yes
Recommended Texts	- Solid wastes Engineering Principles and Management Issues/ George Tchobanglous , Hilary Theisen	No
Websites		

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.

MODULE DESCRIPTION FORM

Module Information				
Module Title	Water supply		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☒ Seminar	
Module Code	ENVT319			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	3	Semester of Delivery	2	
Administering Department	Environmental Technology	College	Environmental science	
Module Leader	Mohammed Fakhraldeen Ahmed	e-mail	milhebi@uomosul.edu.iq	
Module Leader's Acad. Title	Assistant professor	Module Leader's Qualification	MSc.	
Module Tutor	Amna Ibrahim Ahmed Hussein Abeer Saleh Attia	e-mail e-mail	amena.ibraheem@uomosul.edu.iq abeer.aljomelly@uomosul.edu.iq	
Peer Reviewer Name		e-mail		
Scientific Committee Approval Date	/ /2025	Version Number	1.0	

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

Module Aims, Learning Outcomes and Indicative Contents

Module Aims	1. The student acquires a skill in understanding the vocabulary of desalination plants. 2. The student acquires the cognitive skill of designing desalination plant units. 3. This semester covers the basic concepts of how raw water is treated and made potable. 4. The student acquires a skill in how desalination plants operate. 5. The student acquires a skill in conducting laboratory tests on desalinated water and matching it to drinking water specifications through relevant practical lessons.
Module Learning Outcomes	1. Introduction to the working vocabulary of water treatment plants. 2. Introduction to the types of intakes, selection criteria for intake locations, design of the suction pipe, backwash pipe, and suction wells. 3. Low-pressure pumps, operating point, and net pressure suction head (NPSH).. 4. Water and pump capacity, determining motor and pump efficiencies, and the difference between series and parallel pump connections. 5. Rapid mixing tanks and their design requirements, required rapid mixing capacity, and velocity gradient. 6. Flocculation and coagulation tanks and their design requirements, with examples of flocculation tank design. 7. Types of coagulants used, advantages, and disadvantages of each type, with solutions. 8. Derivation of the surface overflow rate and Stoke's Law, and determination of removal ratios. 9. Types of sedimentation: discrete, hindered, incompressible, and retarded sedimentation, with practical examples. 10. Types of filters and calculating the number of filters. 11. Types of downholes and calculating the sand liquefaction rate. 12. Types of sterilization and the advantages and disadvantages of each type. 13. Lecture on water softening, with examples. 14. Desalination using reverse osmosis, with examples.

	15. Chapter review.
Indicative Contents	1) Chapter One: Introduction to the general workings of water treatment plants, including intake types, intake location selection criteria, and design of the suction pipe, backwash pipe, filter, and suction wells (6 hours). 2) Chapter Two: Water and pump capacity, determining the efficiency of the motor and pump, the difference between connecting pumps in series and in parallel, the operating point, and determining the net positive absorption charge (12 hours). 3) Chapter Three: Rapid Mixing Tanks and Their Design Requirements, Requirements for Rapid Mixing, Velocity Gradient, Flocculation and Coagulation Tanks and Their Design Requirements, Explanation of Flocculation Tank Design Examples, Types of Coagulants Used, and Advantages and Disadvantages of Each Type (16 Hours) 4) Chapter Four: Surface Overflow Rate, Stoke's Law, and Determining Removal Rates, speed gradient rate, Types of Sedimentation: Discrete, discrete, Compression, and hindered Sedimentation, Practical Examples of Sedimentation Types (16 Hours). 5) Chapter Five: Types of Filters and Calculating the Number of Filters, Explanation of types of down sewers, and Calculating sand liquefaction velocity (10 Hours) 6) Chapter Six: Types of Sterilization and the Advantages and Disadvantages of Each Type, Determining the Breakpoint and the Added Chlorine Dose. (6 Hours). 7) Chapter Seven: Hard Water Treatment Methods (Water Softening) (5 Hours) 8) Chapter Eight: Types of networks transporting treated water, types of pipes used, types of seals used (4 hours). 9) Chapter Nine: Water desalination using reverse osmosis with explanation and examples (4 hours.).

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy adopted in delivering this unit is to encourage students to participate in exercises, while simultaneously enhancing and expanding their critical thinking skills. This will be achieved through interactive classes and tutorials, and by considering the type of simple experiments that include sampling activities of interest to students, in addition to conducting field visits to some of the wastewater treatment plants operating in Mosul.

Student Workload (SWL) الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا
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Structured SWL (h/sem)	78	Structured SWL (h/w)	5
Unstructured SWL (h/sem)	72	Unstructured SWL (h/w)	5
Total SWL (h/sem)	150		

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	5% (5)	2, 12	LO # 3, 4, 6 and 7
	Projects / Lab.	2	15% (15)		
	Report	1	10% (10)	13	LO # 7, 12 and 14
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-7
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		100% (100 Marks)

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to the general working vocabulary of water treatment plants.

Week 2	Explanation of determining the volume of service tanks using the schematic method.
Week 3	Types of intakes and selection criteria for intake sites. Design of the suction pipe, backwash pipe, strainer, and suction wells.
Week 4	Low-pressure pumps, operating point, finding the net positive suction charge.
Week 5	Water and pump capacity, finding the efficiency of the motor and pump. Difference between connecting pumps in series and parallel.
Week 6	Rapid mixing tanks and design requirements. Required power for rapid mixing. Rate gradient. Solving examples.
Week 7	Mid-term exam.
Week 8	Flocculating and coagulating tanks and design requirements. Design examples for flocculation tanks.
Week 9	Types of coagulants used and the advantages and disadvantages of each type.
Week 10	Derivation of the surface overflow rate. Stoke's law. Finding removal ratios. Solving examples.
Week 11	Types of sedimentation: discrete and sintered sedimentation. Solving examples.
Week 12	Types of filters and calculating the number of filters, types of downholes, calculating sand liquefaction velocity.
Week 13	Types of sterilization and the advantages and disadvantages of each type.
Week 14	Methods of treating hard water (water softening), types of networks, types of conveying pipes, and types of locks.
Week 15	Water desalination methods using reverse osmosis, with an explanation and an example.
Week 16	Preparing for the final exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Introduction to Experiments, Local and International Standards for Drinking Water
Week 2	Critical Odor Number and Color

Week 3	pH Test & Turbidity Test
Week 4	Hardness Test
Week 5	Jar Test
Week 6	Finding Service Tank Volume Using the Graphical Method
Week 7	Midterm Exam
Week 8	Total Dissolved Solids Test & Electrical Conductivity Test
Week 9	Determining Residual Chlorine Concentration & Break Point Dosage
Week 10	Total Nitrite Test
Week 11	Sulfate Test
Week 12	Chloride Test
Week 13	Coefficient of Uniformity (CU) Test
Week 14	
Week 15	
Week 16	

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Water supply and sewerage Authors :Terence-MGmghee and E. w. steel	NO
Recommended Texts	Water supply engineering design Authors : M. anis Al-layla, Shamim Ahmed , E. Joe Middlebrook	No

Websites	
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MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Biochemistry		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	ENVT328		
ECTS Credits	4		
SWL (hr./sem.)	100		
Module Level	3	Semester of Delivery	1
Administering Department	Environmental Technologies	College	Environmental sciences
Module Leader	Mayada Ahmed AL-Taii MaanHashimMahmood	e-mail	maysbio55@uomosul.edu.iq maanhashim@uomosul.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Diana Nooraldine Mustafa Abdullah AbdusttarThanoon	e-mail	Dyasbio86@uomosul.edu.iq abdullah84@uomosul.edu.iq
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	30/6/2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	General biology	Semester	1
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- Biochemistry is concerned with the chemical composition of the components of a living cell and the course of biochemical reactions within them. 2- Study the chemical nature of the various types of nutrients and structural components of the cell and understand their biological functions within it. 3- Understand the chemical composition of carbohydrates, proteins, nucleic acids, and lipids, the differences between them, and identify the functions of each in the cells of the living organism.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Learn about biochemistry and understand the phenomenon of the unity of life among different life forms. 2- Distinguish the chemical composition of carbohydrates as structural units and nutrients for cells. 3- Understand the structural nature of proteins and their important role in the vitality of all cells, especially enzymes. 4- Identify the functions, types, and compositions of lipids. 5- Distinguish the types of nucleic acids, their compositions, and their key role in cell life. 6- Identify the effects of some pollutants on cell vitality and components.
Indicative Contents المحتويات الإرشادية	The course content includes the following: Introduction to Biochemistry - The basic chemical elements of life - Water and solutions - Laboratory safety in the chemistry lab (8 hours) Carbohydrates - Functions and types - Monosaccharides - Oligosaccharides and polysaccharides - Molisch's test - Benedict's test for sugars - Parvoid's test and

	Sullivan's test for sugars - Bayle's test and iodine test for sugars (17 hours) Amino acids - Midterm exam - Peptides - Proteins - Functions and types - Protein structures - Enzymes - Proteins, their functions, and physical properties - Amino acids - Biuret's test and Ninhydrin's test for proteins - Hopkin Cole's test and Xanthoprotic's test for proteins - Millon's test and Sakakoji's test for proteins - Cysteine and cysteine test for proteins - Identification of an unknown substance (protein or sugar) (29 hours) Lipids - Functions and types - Fatty acids - Lipid detection / Glycerol detection test (Acrolein detection) - Lipid pH (rancidity) determination test (10h) Nucleic acids / nucleotides - Nucleic acids / RNA, DNA - Effect of pollutants on biological compounds - Detection of nucleic acids (DNA, RNA) (11h)
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	The main strategy adopted in presenting this material is to encourage students to read and discuss, and to develop the skills of scientific observation and description of phenomena, while simultaneously enhancing their critical thinking skills. This will be achieved through daily and semester tests, daily discussions, and practical observations in laboratory experiments that include conducting laboratory tests relevant to the subject matter.
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (hr./sem.) الحمل الدراسي المنتظم للطالب خلال الفصل	60	Structured SWL (hr./w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (hr./sem.) الحمل الدراسي غير المنتظم للطالب خلال الفصل	40	Unstructured SWL (hr./w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.7
Total SWL (hr./sem.) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	1 lec. 1 lab.	20% (10)	Lab. 5 , 11 Lec. 5 ,11	LO # 1,2 and 3
	Assignments	1	10% (10)	13	LO # 4
	Lab.	1	10% (10)	Continuous	All
	Report	-----	-----	-----	-----
Summative assessment	Midterm Exam	1 hr.	10% (10)	7	LO # 1,2,3
	Final Exam	3hr.	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Biochemistry - The Chemical Elements of Life
Week 2	Water and Solutions
Week 3	Carbohydrates: Functions and Types
Week 4	Carbohydrates: Monosaccharides
Week 5	Carbohydrates: Oligosaccharides and Polysaccharides Daily Exam 1
Week 6	Amino Acids

Week 7	Midterm Exam – Peptides
Week 8	Proteins: Functions and Types
Week 9	Proteins: Protein Structures
Week 10	Enzymes
Week 11	Lipids: Functions and Types Daily Exam 2
Week 12	Fatty Acids
Week 13	Nucleic Acids / Nucleotides
Week 14	Nucleic Acids / RNA, DNA
Week 15	The Effect of Pollutants on Biomolecules
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Laboratory Safety in the Chemistry Lab
Week 2	Mollich's Test
Week 3	Benedict's Test for Sugars
Week 4	Parvoid's Test and Sullivanov's Test for Sugars
Week 5	Bayle's Test and Iodine Test for Sugars - Daily Exam 1
Week 6	Proteins, Their Functions and Physical Properties
Week 7	Amino Acids
Week 8	Biuret's Test and Ninhydrin's Test for Proteins

Week 9	Hopkin-Cole's Test and Xanthoprotic's Test for Proteins
Week 10	Millon's Test and Sakakoji's Test for Proteins
Week 11	Cysteine and Cysteine Test for Proteins - Daily Exam 2
Week 12	Identification of an Unknown Substance (Protein or Sugar)
Week 13	Lipid Test / Glycerol Test (Acrolein Test)
Week 14	Lipid pH Test (Rancidity)
Week 15	DNA and RNA Detection

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	احمد، طارق يونس و الهلالي ، لؤي عبد علي. الكيمياء الحياتية ج1 (2010). دار ابن الأثير للطباعة والنشر ، جامعة الموصل.	Yes
Recommended Texts	آل- فليح ، خولة احمد. مدخل الى الكيمياء الحياتية (2000). دار الكتب للطباعة والنشر، الموصل ، العراق.	Yes
Websites		

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.



MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Biotechnology		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	ENVT332		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester of Delivery	2
Administering Department	Environmental Technologies	College	Environmental sciences
Module Leader	Dr. Mayada Ahmed AL-TaiiMaanHashimMahmood	e-mail	maysbio55@uomosul.edu.iq maanhashim@uomosul.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D
Module Tutor	Diana Nooraldine Mustafa Abdullah AbdusttarThanoon	e-mail	Dyasbio86@uomosul.edu.iq abdullah84@uomosul.edu.iq
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date	30/6/2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Biochemistry	Semester	UG3
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The course aims to provide students the knowledge to understanding of specialized applications related to the biological activity and metabolic capacity of living organisms, including microorganisms and plants, and their molecular biology, to clarify their role in technical fields to solving and avoiding environmental problems.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	The course covers the details of various bioremediations for various environmental pollutants using different types of organisms and the possibility of genetically modifying them to produce strains with high biological capacity, harnessing them to preserve and sustain the environment and ensure the sustainable use of its resources.
Indicative Contents المحتويات الإرشادية	

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in presenting this course is to encourage students to read and discuss, and to provide the student with the skill of scientific observation and description of the

	phenomenon, while improving their critical thinking skills at the same time. This will be achieved through daily and quarterly examinations and daily discussions.
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Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	60	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	40	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.7
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (5)	5, 10	
	Online assignments	1	10% (10)	6, 12	
	Onsite assignments	1	10% (10)		
	Lab.	2	10% (5)	3, 10	
	Report	-----	-----	=====	

Summative assessment	Midterm Exam	2 hr	10% (10)	7	
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Biotechnology: Definition and Basic Concepts
Week 2	The types of Environmental microorganisms
Week 3	Microbial systems used to treat wastewater
Week 4	Removal of household, industrial and agricultural waste
Week 5	Decomposition of organic matter, formation of humus, and production of compost
Week 6	Bioremediation of petroleum pollutants and inorganic chemicals
Week 7	Bioleaching metals from the environment, Mid Exam
Week 8	Xenobiotics in the environment and methods for their removal
Week 9	Energy and biofuel production
Week 10	Genetically modified organisms (GMOs)
Week 11	Genetic material: construction and replication of nucleic acids
Week 12	Genetic material: protein synthesis
Week 13	Gene Cloning
Week 14	Applications of microbiology in environmental monitoring

Week 15	Final exam
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Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Biosafety in Biotechnology Laboratories
Week 2	Cultivation Media and Preparation Methods
Week 3	Methods for Isolating and Cultivating Microorganisms
Week 4	Using Microscopy and Staining Techniques
Week 5	Microbial Metabolism Tests
Week 6	Biofilms
Week 7	Bioremediation of Petroleum Hydrocarbons by Microorganisms
Week 8	Bioremediation of Heavy Metals by Yeasts
Week 9	Testing Bacterial Resistance to Heavy Metals
Week 10	Biodegradation of Plastics
Week 11	Plasmid Curing
Week 12	Methods for Extracting Nucleic Acids (DNA and RNA)
Week 13	Polymerase Chain Reaction (PCR) (1)
Week 14	Polymerase Chain Reaction (PCR) (2)
Week 15	Final exam

Learning and Teaching Resources
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مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Environmental biotechnology : Concepts and Applications by Jordening, H.J. and Winter, J. (2005) John Wiley and Sons.	No
Recommended Texts	Weaver, R.F. (2012). Molecular Biology. 5 th edition, McGraw –Hill, USA.	No
Websites		

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Molecular spectroscopy techniques		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☒ Seminar
Module Code	ENVT326		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3 (Undergraduate)	Semester of Delivery	2
Administering Department	Department of Environmental Technologies	College	College of Environmental Science
Module Leader	Assist.Prof.Dr.Eman A.M. Al-jawadi	e-mail	emanaljawadi@uomosul.edu.iq
Module Leader's Acad. Title	Assist.Prof.Dr.	Module Leader's Qualification	Ph.D./Chemistry Science -Physical Chemistry
Module Tutor	Abeer Salih Atiya Raghad Nether Ahmad Mohammed Saadallah	e-mail	abeer.aljomelly@uomosul.edu.iq
Peer Reviewer Name	Name	e-mail	E-mail
Scientific Committee Approval Date	01/06/2025	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Chemistry 1+Chemistry 2	Semester	1+2

Co-requisites module	None	Semester	
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Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	The course aims to enable students to gain a specialized understanding of how light interacts with molecules and materials. The course also covers various magnetic spectroscopic methods and their uses for studying chemical and physical properties at an advanced level.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After completing this course, students will be able to: Discuss various spectroscopic methods and compare their advantages and disadvantages Perform simple calculations based on spectroscopic data to obtain molecular properties Use spectroscopy across all magnetic spectrums to plan and perform experiments and calculations Suggest appropriate spectroscopic methods to determine specific molecular properties

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Possess a solid knowledge and in-depth understanding of the correct spectral formula, theoretical concepts of optical, infrared, and advanced magnetic spectroscopy (nuclear magnetic resonance, electron magnetic resonance), and some of their modern applications. - Be able to apply the correct formula to analyze various spectral phenomena (and corresponding data within their spectral range). - Students will be able to apply concepts of quantum physics and chemistry to optical spectroscopy (linear and nonlinear), as well as to magnetic spectroscopy (describing experiments based on pulse sequences as defined by the International Union of Pure and Applied Chemistry (IUPAC), and applying the multiplication factor formula to predict results and optimize sequences, while varying experimental parameters). - Discuss relevant spectroscopic techniques and their interdisciplinary applications. - Evaluate and compare the performance, problems, and applicability of different spectroscopic techniques in light of the chemical problems to be solved and/or the research to be conducted. - Communicate the acquired knowledge, the formula used, and the results of its application using appropriate terminology. - Learn advanced topics by reading scientific articles.
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	Upon completion of this course, students will be able to assess the uncertainty and error limits of spectroscopic data, discuss and critically evaluate the results of measurements performed using molecular spectroscopy, and describe the physical principles of elementary photochemical reactions in terms of the properties of molecules and molecular systems.

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	90	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	60	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation

تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction Spectrometer, spectrophotometer , Molecular spectroscopy definition ELECTROMAGNETIC RADIATION :Spectroscopy is the use of the absorption, emission, or scattering
Week 2	Quantum view: photons, Unification: De Broglie Hypothesis Spectrum for Molecules : Interaction of light with a sample
Week 3	Population of energy levels,Spectroscopic Transitions:Classical Theory,QuantumTheory,Transition modes and Einstein coefficients , DEGREE OF FREEDOM OF MOTION.
Week 4	PURE ROTATIONAL (MICROWAVE) SPECTRA OF DIATOMIC MOLECULES Microwave Interactions, Rotational spectroscopy (microwave spectroscopy),Application of M.W.
Week 5	Vibrational spectroscopy (infrared spectroscopy, Infrared Interactions ,Application of IR
Week 6	Roto-vibrational spectroscopy of diatomic molecules
Week 7	Mid Exam
Week 8	Electronic transitions (ultraviolet and visible spectroscopy), Visible Light Interactions , Ultraviolet Interactions , Application of UV-VIS spectroscopy.
Week 9	Raman Spectroscopy ,Application of Raman Spectroscopy
Week 10	Nuclear magnetic resonance (NMR) spectroscopy(HNMR ,CNMR)
Week 11	Nuclear magnetic resonance (NMR) spectroscopy Application of (NMR) spectroscopy
Week 12	X-ray Interactions.
Week 13	seminar
Week 14	Prepare Final Exam
Week 15	Final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Chemistry Lab Safety and Security Guidelines
Week 2	OPERATION OF THE Spectrophotometer (UV-VIS) AND DETERMINATION OF λ_{max}
Week 3	BEER'S LAW practical A. Preparation of a Calibration Curve B. Determining the Concentration of an Unknown Solution
Week 4	Estimation of an element (for example, nickel) using visible light
Week 5	Analysis of permanganate and dichromate in a mixture using visible light
Week 6	Estimation of potassium nitrate using ultraviolet light
Week 7	Infra-red Spectroscopy... Detecting functional groups in organic compounds using IR in collaboration with the central laboratory (if the device is not available in the laboratory). part .1
WEEK 8	Infra-red Spectroscopy.. Detecting functional groups in organic compounds using IR in collaboration with the central laboratory (if the device is not available in the laboratory)...part .2.
WEEK 9	A visit for practical training on various spectral-based medical devices, such as X-rays, MRI, CT, and ultrasound.
WEEK 10	Seminar
WEEK 11	Review and discussion of reports
WEEK 12	Exam preparation

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	N. E. Jacobsen “NMR SPECTROSCOPY EXPLAINED: Simplified Theory, Applications and Examples for Organic Chemistry and Structural Biology”, John Wiley & Sons, 2007. J. M. Hollas, “Modern Spectroscopy”, 4th edition, Wiley, 2003. P.W. Atkins: Physical Chemistry, 2008	Yes& net.
Recommended Texts	C.N.Banwell: Fundamentals of Molecular Spectroscopy. A. Lund, M. Shiotani, S. Shimida, “Principles and Applications of ESR spectroscopy”, Springer, New York, 2011.	Yes & net.
Websites	https://egov.uok.edu.in/eservices/syllabus/syllabusArchive/7120.PDF https://www.chem.iitb.ac.in/courses_inner/901	

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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
Module Title	Environmental pollution 1		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☒ Seminar
Module Code	ENVT322		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester of Delivery	1
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Abdul SattarJubairZaben HamsaBurhan Mohammed MuhannadQasim Al-Jumaily Amena Ibrahim Ahmed	e-mail	E-mail
Module Leader's Acad. Title	teacher Assistant teacher Assistant teacher Assistant teacher	Module Leader's Qualification	Ph.D. M.Sc. M.Sc. M.Sc.
Module Tutor	Name (if available)	e-mail	E-mail: sattarjubair@uomosul.edu.iq
		e-mail	E-mail:hamsaalbazaz@uomosul.edu.iq
Peer Reviewer Name	Name	e-mail	E-mail:aljumailymuhannad@uomosul.edu.iq
		e-mail	E-mail:amena.ibraheem@uomosul.edu.iq
Scientific Committee Approval Date	30/06/2025	Version Number	1.0

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

Module Aims, Learning Outcomes and Indicative Contents	
Module Aims	Identifying soil pollutants and some chemical properties, and methods for estimating them after taking samples, preparing extracts, estimating cations and anions in soil, methods for analyzing and classifying results, dealing with the soil laboratory, preparing samples for examination, and knowing the approved recommendations for reducing environmental impact.
Module Learning Outcomes	At the end of the semester, the student will gain knowledge about soil pollutants, conduct chemical analyses, and estimate cations and anions in soil. The student will be able to: take soil samples, prepare extracts, examine electrical conductivity and pH, estimate ions in soil extracts in the soil laboratory, present the results, compare them with international classifications, follow recommendations for the study soils, and pay attention to the environmental aspect.
Indicative Contents	The introductory content includes the following: 1. General principles of soil pollution, its sources, nature, and harmful effects, and an introduction to the Soil Pollution Laboratory. 2. Methods of soil sampling and organic matter estimation, and how to prepare soil extracts. 3. Soil salinity, sources of soil salinization, soil pollution by oil, soil pollution by solid waste, pesticides, and chemicals, soil pollution by chemical fertilizers, and soil pollution by organic fertilizers. 4. pH, electrical conductivity, carbonate minerals, cations and anions, heavy metals. 5. Wind erosion, measures taken to protect soil from wind erosion pollution, water erosion, measures taken to protect soil from water erosion pollution, heavy metals, introduction to radioactive pollution and sources of radioactive pollution.

Learning and Teaching Strategies

Strategies	The main strategy adopted in delivering this unit is to familiarize the student with the pollutants that occur in the soil, their source and their impact on the soil, and the extent to which they can be identified through the use of soil laboratories, conducting chemical tests, presenting the practical results, comparing them with the approved classifications, and their impact on the soil and the environmental aspect.
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Student Work load (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	70	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	55	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	
	Assignments	2	10% (10)	2, 12	
	Projects / Lab.	1	10% (10)	Continuous	All
	Report	1	10% (10)	13	
Summative assessment	Midterm Exam	2hr	10% (10)	7	
	Final Exam	3hr	50% (50)	15	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

	Material Covered
Week 1	Soil Pollution: Definition, Introduction to Environmental Quality, Sources and Nature of Soil Pollution, and Its Harmful Effects
Week 2	Soil Salinity, Sources of Soil Salinization
Week 3	Soil Pollution by Oil
Week 4	Soil Pollution by Solid Waste, Pesticides, and Chemicals
Week 5	Soil Pollution by Chemical Fertilizers
Week 6	Soil Pollution by Organic Fertilizers
Week 7	Midterm Exam
Week 8	Wind Erosion
Week 9	Measures to Protect Soil from Wind Erosion Pollution
Week 10	Water Erosion
Week 11	Measures to Protect Soil from Water Erosion Pollution
Week 12	Heavy Metals
Week 13	Introduction to Radiation-Pollution – The Difference Between Ionizing and Non-Ionizing Radiation – Alpha Particles, Beta Particles, Gamma Rays, and Neutrons – Physical Units for Measuring Radiation
Week 14	Sources of Radiation Pollution (Natural – Artificial) – Health Effects of Radiation (Acute – Chronic) – Environmental Effects – Radiation Protection Methods – International and Local Laws and Regulations
Week 15	Final exam

Delivery Plan (Weekly Lab. Syllabus)

	Material Covered
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Week 1	Lab 1: Introduction to Soil Pollutionlab
Week 2	Lab 2: Methods of soil sampling
Week 3	Lab 3: Organic matter
Week 4	Lab 4: Soil extraction procedures
Week 5	Lab 5: pH meter
Week 6	Lab 6: Electrical Conductivity (EC)
Week 7	Lab 7: Midterm Exam
Week 8	Lab 8: Carbonate minerals
Week 9	Lab 9: $K^+ + Na^+$
Week 10	Lab 10: $Mg^{++} + Ca^{++}$
Week 11	Lab 11: $HCO_3^- + CO_3^{=}$
Week 12	Lab 12: Cl^-
Week 13	Lab 13: Heavy metals

Learning and Teaching Resources		
	Text	Available in the Library?
Required Texts	Soil Pollution. Origin, Monitoring & Remediation.2008. Ibrahim A. Mirsal	YES
Recommended Texts	Soil Pollution: From Monitoring to Remediation,2nd Edition,2025. Editors: Teresa Rocha-Santos, AnabelaCachada, Armando C. Duarte	No
Websites	https://www.alibris.com/search/books/subject/Soil-pollution	

Grading Scheme				
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.				

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Geographic information systems		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☒ Practical ☐ Seminar	
Module Code	UoB12345			
ECTS Credits	5			
SWL (hr/sem)	125			
Module Level	3	Semester of Delivery		2
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	Raid Mahmood Faisal		e-mail	raidalfaisalm@uomosul.edu.iq
Module Leader's Acad. Title	Assistant Professor		Module Leader's Qualification	M.Sc.
Module Tutor	Asmaa moayad saadallah		e-mail	Asmaa.m@uomosul.edu.iq
Peer Reviewer Name	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. Employ GIS techniques and programs in diagnosing and solving environmental problems. 2. The concept of coordinate systems and maps projections. 3. This course deals with the basic concepts of spatial and attribute data that form the basis of a geographic information system. 4. The concept of vector data and raster data models and the mechanisms for dealing with them. 5. Production and design of digital maps.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Identify the tasks or applications of the geographic information system. 2. Stages of creating and digitizing layers within ArcGIS. 3. Summarize what is meant by the geographical coordinate system, the projection coordinate system, and the UTM projection system. 4. Discuss the interaction or interrelationship of spatial data with attributes, which is the basis for building a GIS. 5. Identify the vector and raster data model properties. 6. Learn about the structure of spatial databases. 7. Determine the data types in the attribute tables and the stages of their formation. 8. Identify methods for the symbolization and classification of data in GIS. 9. An explanation of some spatial analysis tools and applications within the Arc Toolbox program. 10. Learn about the stages of preparing spatial interpolation maps within the Geostatistical Analyst 11. Learn the principles of designing and producing maps.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. <u>Part A (Theory)</u> Introduction to Geographic Information System (GIS) Definition of the system, stages of its development and applications, components of the Geographic Information System (GIS), applications of GIS in the field of environment, data sources used in building the system (primary and secondary sources) Coordinate systems and map projections, geodetic system (Datum), Transverse Mercator Projection System

	(UTM).[16 hrs]. Part B (Practical) Introduction of ArcGIS, Arc Catalog, Arc Map (explanation of the program interface and toolbar), Georeferencing Imagery, Digitization Operations, and Advanced Editing , Editor toolbar. [24 hrs] <u>Part C (Theory)</u> Digital representation of data in GIS , Vector data model, Raster data model, Geodatabase architecture, Non-spatial data, Coding and classification of data in GIS, Cartography and map production [14 hrs]. <u>Part D (Practical)</u> Building or generating metadata tables (attributes tables), field calculator, calculate geometry, design, output and print map layout. [21 hrs]
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Learning and Teaching Strategies			
استراتيجيات التعلم والتعليم			
Strategies	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.		
	Student Workload (SWL)		
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	78	Structured SWL (h/w)	5

الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	47	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.67
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation					
تقييم المادة الدراسية					
		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
التقييم التكويني	الامتحانات اليومية	3	30 % (30)	4,6,9,11	LO #1, 2, 10 and 11
	الواجبات الالصفية (البينية)	2	0 % (0)		LO # 3, 4, 6 and 7
	المختبر. / المشاريع	2	10 % (10)	Continuous	All
التقييم الختامي	إختبار نصف الفصل	2 hr	10% (10)	7	LO # 1-7
	الامتحان النهائي	3hr	50% (50)	15	All
التقييم الإجمالي			100% (100 درجات)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Geographic Information System (GIS), System definition, stages of development and applications.
Week 2	Components of (GIS), applications of (GIS) in the field of environment

Week 3	Data sources adopted in building the system (primary sources and secondary sources) p1
Week 4	Data sources adopted in building the system (primary sources and secondary sources) p2
Week 5	Mercator Transverse Projection System (UTM) p1
Week 6	Mercator Transverse Projection System (UTM) p2
Week 7	Coordinate systems and map projections, geodetic system (Datum)
Week 8	Mid-term Exam + Unit-Step Forcing, Forced Response
Week 9	Digital representation of data in GIS, (vector data model),(Raster data model) p1
Week 10	Digital representation of data in GIS, (vector data model),(Raster data model) p2
Week 11	Geodatabase structure, non-spatial data (attributes tables)
Week 12	Symbolization and classification of data in GIS p1
Week 13	Symbolization and classification of data in GISp2
Week 14	Cartography and map production
Week 15	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Introduction of ArcGIS, Arc Catalog
Week 2	Lab 2: Arc Map (explanation of the program interface and toolbar)
Week 3	Lab 3: Georeferencing ImageryP1
Week 4	Lab 3: Georeferencing Imagery P2+ Daily exam

Week 5	Lab 5: Digitization Operations P1
Week 6	Lab 6: Digitization Operations P2
Week 7	Lab 7: Digitization Operations P3
Week 8	Lab 8: Advanced Editing, Editor toolbar
Week 9	Lab 9: Daily exam
Week 10	Lab 10: Build an attribute data P1
Week 11	Lab 11: Build an attribute data P2
Week 12	Lab 12:Field calculator, calculate geometry
Week 13	Lab 13: Symbolization and classification of data in GIS
Week 14	Lab 14:Design, production and printing of the map (layout)
Week 15	Lab 15:Review

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	مبادئ علم نظم المعلومات الجغرافية ، د. جمعة محمد داؤود	No
Recommended Texts	نظم المعلومات الجغرافية وقواعد البيانات	No
Websites	https://www.youtube.com/@GomaaDawod	

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.

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	ENVIRONMENTAL SUSTAINABILITY		Module Delivery	
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☒ Seminar	
Module Code	ENVT330			
ECTS Credits	3			
SWL (hr/sem)	75			
Module Level	3	Semester of Delivery		2
Administering Department	Type Dept. Code	College	Type College Code	
Module Leader	Tahseen ALI Husain		e-mail	tahssenali1967@uomosul.edu.iq
Module Leader's Acad. Title	lecturer		Module Leader's Qualification	Ph.D.
Module Tutor	YasirHazimYounus		e-mail	yasir.younis@uomosul.edu.iq
Peer Reviewer Name	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	Math 1, Math 2, Environmental Science		Semester	
Co-requisites module	Renewable energy		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	1. Explain concept of sustainability and sustainable development 2. Explain tools of sustainability. 3. Explain steps life cycle assessment 4. explain methods to implement greentechnology.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. explain the concept of sustainability 2. explain environmental management System 3. describe life cycle assessment for products made of different material 4. describe the concept of sustainability to develop sustainable habitat 5. explain different practices to move industries towards sustainability 6. discuss various methods to implement green technology 7. explain of the natural resource and environmental challenges that will face in designing for sustainability 8. explain analysis frameworks for addressing environmental issues and sustainability 9. explain with a description of the selection of green and sustainable materials 10. explain a series of principles to make engineering designs more sustainable and tools that can be used to evaluate.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Introduction to Sustainability Definitions, Sustainability Challenge, energy, materials used, water, Environmental Emissions, requirements for sustainability, approaches toward sustainability. [6hrs] concepts of sustainable development: three pillar model, egg of sustainability model, Atkisson's pyramid model, prism model. Sustainable Development Goals .

	Tools for Sustainability Environmental management System (EMS), life cycle assessment (LCA) Life cycle [6hrs] Life cycle framework Defining life cycles, steps for life cycle assessment : goal definition and scope, inventory analysis, footprint assessment, carbon footprint, water footprint [6hrs] Life cycle networks Process network analysis (mathematical framework, allocation method) Input- output analysis (mathematical framework, environmental extended input-output method) Hybrid models [6hrs]
	Green, Sustainable Materials Environmental and Natural Resource Use Footprints of Material Extraction and Refining,Tracking Material Flows,Environmental Releases. [12hrs]
	Design for Sustainability: Economic, Environmental, and Social Indicators Economic Performance Indicators, Environmental Performance Indicators, Social Performance Indicators.
	Sustainable Habitat - Concept of green building, green building materials, green building certification and rating: green rating for integrated habitat assessment (GRIHA) , leadership in energy and environmental design (LEED) rating, energy

	efficient buildings, sustainable cities. [9hrs]
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Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	The main strategy that will be adopted in presenting this module is for students to participate in exercises, with reports for case studies. This will be achieved through classes, interactive tutorials and through reading on subject topics

Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	45	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	30	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	15% (15)	3, 10	LO #1, 2, and 3
	Assignments	4	15% (15)	4, 12	LO # 2, and 3
	Report	1	10% (10)	11	All
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1,2,3
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Definitions, Sustainability Challenge, energy, materials used, water, Environmental Emissions, requirements for sustainability, approaches toward sustainability.
Week 2	concepts of sustainable development: three pillar model, egg of sustainability model, Atkisson's pyramid model, prism model. Sustainable Development Goals
Week 3	Environmental management System (EMS), life cycle assessment (LCA) Life cycle
Week 4	Defining life cycles, steps for life cycle assessment : goal definition and scope, inventory analysis
Week 5	footprint assessment, carbon footprint, water footprint
Week 6	Life cycle networks Process network analysis (mathematical framework, allocation method)
Week 7	Mid-term Exam
Week 8	Input- output analysis (mathematical framework, environmental
Week 9	extended input-output method
Week 10	Hybrid models
Week 11	Green, Sustainable Materials Environmental and Natural Resource Use Footprints of Material Extraction and Refining
Week 12	Tracking Material Flows, Environmental Releases
Week 13	Design for Sustainability: Economic, Environmental, and Social Indicators
Week 14	Economic Performance IndicatorsEnvironmental Performance Indicators, Social Indicators.

Week 15	Sustainable Habitat - Concept of green building, green building materials, green building certification and rating: green rating for integrated habitat assessment (GRIHA) , leadership in energy and environmental design (LEED) rating, energy efficient buildings, sustainable cities
Week 16	Preparatory week before the final Exam

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	R. L. Rag and LekshmiDinachandranRemesh. Introduction to Sustainable Engineering. 2nd Edition, PHI Learning Pvt. Ltd., 2016.	Yes
Recommended Texts	D. T. Allen and D. R. Shonnard. Sustainability Engineering: Concepts, Design and Case Studies, 1st Edition, Prentice Hall, 2011	No
	A.S. Bradley, A. O. Adebayo, P.Maria. Engineering applications in sustainable design and development, 1st Edition, Cengage learning, 2016	No
Websites	https://www.coursera.org/browse/physical-science-and-engineering/environmental-science-and-sustainability	

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Water Quality		Module Delivery
Module Type	core		☒ Theory ☒ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	ENVT331		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	3	Semester of Delivery	1
Administering Department	Type Dept. Code	College	Type College Code
Module Leader	Dr. Hazim Jumaa Mahmood	e-mail	hazimjm@uomosul.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	Ph.D.
Module Tutor	Name (if available)	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	6. The module is intended to equip students with skills in the field of water monitoring and quantitative analysis of critical water quality parameters. It also brings in those aspects of chemistry which are important for water quality assessment, management and pollution control. 7. Learn how to classify water and determine its suitability for various uses.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	12. Create a water-sampling plan. 13. The ability to identify the main sources of chemical ions in water 14. Understand and characterize important physical, chemical and biological water quality parameters and their implication in water quality issues 15. Calculate concentrations, perform unit conversions, and validate analytical data 16. Analyze and interpret water quality data 17. Application of water quality indices and assessment of water quality for various uses 18. Perform Water classification. 19. Understanding the water quality determinants and standards
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. General properties of water. [3hrs] Water sampling. [2hrs] Physical, chemical and biological parameters. [16hrs] Analysis of Water Quality Parameters. [20hrs] Water quality indices and standards. [6hrs] Irrigation water quality. [5hrs]

	hydrochemical classification of water types. [7 hrs]
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Learning and Teaching Strategies			
استراتيجيات التعلم والتعليم			
Strategies	This course will be delivered through a combination of lectures, discussions, exercises, and laboratory analyses. The key strategy for presenting this subject will be to stimulate student participation while also polishing and strengthening their critical thinking skills. Student learning will be assessed through graded laboratory tests and examinations covering lecture content and through practical quizzes on lab exercises.		
Student Workload (SWL)			
الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
Structured SWL (h/sem)	63	Structured SWL (h/w)	4
الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem)	12	Unstructured SWL (h/w)	1
الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem)	75		
الحمل الدراسي الكلي للطالب خلال الفصل			

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10	LO #1- 5
	Assignments	1	10% (10)	2, 12	LO # 1-6

	Projects / Lab.	2	10% (10)	Continuous	All
	Report	1	10% (10)	13	All
Summative assessment	Midterm Exam	2 hr	10% (10)	7	LO # 1-4
	Final Exam	2hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction
Week 2	Water sampling
Week 3	Physical parameters of water quality– Part One
Week 4	Physical parameters of water quality– Part Two
Week 5	Chemical parameters of water quality– Part One
Week 6	Chemical parameters of water quality– Part Two
Week 7	Mid-term Exam
Week 8	Trace elements in water
Week 9	Heavy metals in water.
Week 10	Biological properties of natural waters
Week 11	Drinking Water Quality
Week 12	Water quality indices
Week 13	Irrigation water quality

Week 14	hydrochemical classification of water types
Week 15	Water Quality Regulations
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Electrical conductivity measurement and Solids Analysis
Week 2	Lab 2: Field Sampling and Analysis of field Water Quality Parameters (Temperature, pH, turbidity, Electrical conductivity and Total Dissolved Solids)
Week 3	Lab 3: Determination of hardness
Week 4	Lab 4: Determination of calcium and magnesium ions
Week 5	Lab 5: Determination of carbonate and bicarbonate ions
Week 6	Lab 6: Determination of chloride ions
Week 7	Lab 7: Determination of sulphate ions
Week 8	Lab 8: Determination of sodium and potassium ions
Week 9	Lab 9: Units conversion and salts formula calculation
Week 10	Lab 10: hydrochemical classification of water types (Stiff diagram)
Week 11	Lab 11: hydrochemical classification of water types (Piper diagram)
Week 12	Lab 12: Water classification for irrigation uses

Learning and Teaching Resources
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مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Water Quality: An Introduction 2nd Edition (2015), Claude E. Boyd.	
Recommended Texts	Clean Water: An Introduction to Water Quality and Water Pollution Control, 2nd Edition (2003), Kenneth M. Vigil, P.E.	
Websites		

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
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	F – Fail	راسب	(0-44)	Considerable amount of work required
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