نموذج وصف البرنامج الاكاديمي

اسم الجامعة : تكريت

الكلية: الهندسة

القسم العلمي: هندسة البيئة

اسم البرنامج الاكاديمي او المهني: بكالوريوس هندسة بيئة

اسم الشهادة النهائية: بكالوريوس علوم في هندسة البيئة

النظام الدراسي: فصول دراسية

تاريخ اعداد الوصف : 2025/1/12

تاريخ مليء الملف: 2025/1/12

التوقيع

اسم المعاون العلمي: ا.م.د. سعد محمود رؤوف

التاريخ: ٢٠٢٥/١/

التوقيع

اسم رئيس القسم : م.اكرم خلف محمد

التاريخ: ٢٠٢٥/١/١٥

دقق الملف من قبل

شعبة ضمان الجودة و الاداء الجامعي

اسم مدير شعبة ضمان الجودة والاداء الجامعي : م.د. احمد ياسر رديف

التاريخ: ٢٠٢٥/١/٢٠

التوقيع

مصادقة السيد العميد

٢٠٢٥/١/٢١

الاستاذ المساعد الدكتور

سعد رمضان احمد

عميد كلية الهندسة

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المـادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	ANALYTICAL CHEMISTRY		Module Delivery	
Module Type	C		Theory Lab.	
Module Code	ENVR-ENG-104			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	1	Semester (s) offered	2
Min number of students	15	Max number of students	100
Administering Department	Environmental Engineering	College	Engineering
Module Leader	Ahmed Khaleel Ibrahim	e-mail	Ahmedkh71@tu.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	MSc
Module Tutor	None	e-mail	None
Peer Reviewer Name	Dr. Salwa Hadi Ahmed	e-mail	Dr.salwahadi@tu.edu.iq
Review Committee Approval	01/06/2023	Version Number	1.0

Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى

Prerequisite module	None	**Semester**	-
Co-requisites module	Environmental Chemistry	**Semester**	1

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	1) Giving general information about chemicals and methods of dealing with them 2) Explanation of methods of chemical analysis of chemical compounds 3) Calculations of reactant and product quantities in chemical reactions 4) Analysis and calculation of the amount of substances constituting chemical compounds 5) Give detailed information about pH.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Using both techniques and concepts in calculations related to chemicals. 2) Knowledge of quantitative and qualitative analysis methods 3) Analyzing chemical compounds and rocks and knowing the quality and quantity of each element. 4) Using mathematical methods to calculate the pH values.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Chemical reactions (6 hrs) • Chemical analysis (6 hrs) • Equilibrium of a Chemical reactions (6 hrs) • pH calculations (10 hr) • Exam (2 hr)
Course Description	Analytical chemistry is the study of elements and compounds in materials in the three cases solid, liquid, and gas, and knowing its percentages and quantities in the materials and knowing acidity or alkalinity of solutions and methods of its calculations..

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل			Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
In class lectures	30	78		
In Lab Lectures	45			
In class tests	3			
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل			Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Library, dorm, home memorizing	40	72		
Preparation for tests	12			
Homeworks	20			
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل		150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	15% (15)	5, 8,12	LO #1, 2, 3, and 4
	Assignments (Homeworks)	5	10% (10)	2, 4, 6, 8, 10	LO # 1, 2, 3, 4, and 5
	Laboratory reports	15	15% (15)	Continuous	LO # 4
Summative assessment	Midterm Exam	2	10% (10)	7	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction of analytical chemistry, quantitative analysis, qualitative analysis
Week 2	Gravimetric calculations of chemical analysis
Week 3	Calculations involving concentrations of solutions, physical methods, Molar Methods, Equivalent Methods
Week 4	Dilution of solutions
Week 5	Analysis of samples by titration with standard solution
Week 6	Calculation of Oxidation – Reduction titration, Equilibrium reactions

Week 7	**Midterm Exam**
Week 8	Acid – base equilibrium and PH of solutions, Equilibrium constant
Week 9	Expression of equilibrium constant in acidic medium
Week 10	Expression of equilibrium constant in basic medium
Week 11	Calculation of pH of aqueous solution, Weak acid plus its salt
Week 12	Titration curves, Strong acid- strong base, Weak acid – strong base
Week 13	strong acid – weak base, weak acid – weak base
Week 14	Acid — Base indicator
Week 15	pH dilution
Week 16	**Final Exam**

Analytical chemistry (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Identifying laboratory chemicals, their conditions, risks, and the correct ways to identify them.
Week 2	Lab 2: Identifying laboratory equipment, names, and terms.
Week 3	Lab 3: Preparation & Standardization From solid
Week 4	Lab 4:Preparation & Standardization From solid, continue
Week 5	Lab 5: Preparation & Standardization From liquid
Week 6	Lab 6: Preparation & Standardization From liquid, continue
Week 7	Lab 7: Titration of Sodium Carbonate with Hydrochloric acid (Acid – Base Titration)
Week 8	Lab 8: Titration of Sodium Hydroxide with Hydrochloric acid (Acid – Base Titration)
Week 9	Lab 9: Titration of Mixture with Hydrochloric acid (Acid – Base Titration)
Week 10	Lab 10: Determine the concentration of a given base using a standard acid
Week 11	Lab 11: Determine the concentration of a given acid using a standard base
Week 12	Lab 12: Qualitative analysis
Week 13	Lab 13:pH determinations of acid and base
Week 14	Lab 14:pH determinations of salts
Week 15	Lab 15: pH dilution

<table>
<tr><td colspan="3" align="center">**Learning and Teaching Resources**
مصادر التعلم والتدريس</td></tr>
<tr><td></td><td align="center">**Text**</td><td align="center">**Available in the Library?**</td></tr>
<tr><td>**Required Texts**</td><td>**Analytical chemistry (Book)/ 7th Edition
Gary D. Christian, Purnendu K. Dasgupta, Kevin A. Schug
ISBN: 978-0-470-88757-8**</td><td align="center">Yes</td></tr>
<tr><td>**Recommended Texts**</td><td>**General chemistry book**</td><td align="center">yes</td></tr>
<tr><td>**Websites**</td><td>N/A</td><td></td></tr>
</table>

APPENDIX:

Group	Grade	التقدير	Marks (%)	Definition
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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

GRADING SCHEME
مخطط الدرجات

Note:

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

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	CALCULUS I	**Module Delivery**	
Module Type	BASIC	Theory Tutorial	
Module Code	MATH-101		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	1	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Tahseen Taha Othman	**e-mail**	tahseentaha@tu.edu.iq
Module Leader's Acad. Title	Assistant Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor	Maaly Nasrat Tawfiq	**e-mail**	Maaly.n.tawfeq@tu.edu.iq
Peer Reviewer Name	Prof. Dr. Raad H. Irzooqi	**e-mail**	Dr.raadhoobi@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	CALCULUS II	**Semester**	2

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	1) Be able to solve equations both algebraically and graphically 2) Be able to solve and analyze engineering problems. 3) Solve the problems choosing the most suitable method. 4) To develop logical understanding of the subject. 5) To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem from Engineering fields.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Ability to identify, formulates, and solves engineering problems. 2) Represent functions using power series 3) Evaluate the behaviors and graphs of functions 4) Apply integrals to geometric application, physical application, and modeling problems 5) Use basic integration techniques to calculate area.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Transcendental Functions (16 hrs) • Methods of Integration (20hrs) • Hyperbolic Function (16hrs) • Power Series(20hrs)
Course Description	This subject covers techniques of integration, exponential and logarithmic functions , Hyperbolic Function and Taylor's Series.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **72** **In class tests** **6**	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **dorm, home memorizing** **40** **Preparation for tests** **20** **Homeworks** **12**	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	24% (24)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments (Homework's)	6	16% (16)	2, 4, 6, 10, 12, 14	LO # 1, 2, 3, 4 and, 5
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Transcendental Functions
Week 2	Transcendental Functions , cont'd
Week 3	Solved examples and problems
Week 4	Methods of Integration, By parts
Week 5	Methods of Integration, Products of Powers of Trigonometric functions
Week 6	Methods of Integration ,Even powers of Sine and Cosine
Week 7	Trigonometric substitutions that replace $a^2 - u^2,\ a^2 + u^2\ and\ u^2 - a^2$
Week 8	**Midterm exam**

Week 9	Hyperbolic Function , Derivatives and Integrals of Hyperbolic Function
Week 10	Inverse of Hyperbolic Function
Week 11	Solved examples and problems
Week 12	Power Series, Taylor Polynomials
Week 13	Taylor's Series for Sine, Cosine and ex
Week 14	Binomial Theorem
Week 15	Solved examples and problems
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Calculus and analytical geometry, George B. Thomas Jr.; Addison – Wesley publishing company, 7th edition, 1988.**	Yes
Recommended Texts	**- Calculus; James Stewart, 10th edition, 2003.**	No
Websites	N/A	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		

Module Title	CALCULUS II		**Module Delivery**	
Module Type	BASIC			
Module Code	MATH-102		**Theory** **Tutorial**	
ECTS Credits	6			
SWL (hr/sem)	150			

Module Level	1	**Semester (s) offered**	2
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Tahseen Taha Othman	**e-mail**	tahseentaha@tu.edu.iq
Module Leader's Acad. Title	Assistant Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor	Maaly Nasrat Tawfiq	**e-mail**	Maaly.n.tawfeq@tu.edu.iq
Peer Reviewer Name	Prof. Dr. Raad H. Irzooqi	**e-mail**	Dr.raadhoobi@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Calculus I	**Semester**	1
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1) Be able to calculate the tangent and normal vectors. 2) Be able to apply differential operators to scalar and vector fields. 3) Be able to determine the limit and continuity of a functions of two variables. 4) Be able to determine the domain, codomain, range of functions of two or more variables, to do algebraic operations between them and sketch their graphs. 5) Be able to evaluate the derivatives of functions ot two or more variables. 6) Be able to solve simple real problems related to derivatives of functions of two or three variables. 7) Be able to solve problems related to integral of functions of two or three variables. 8) Be able to understand that the modulus of a complex number is equal to the square root of the sum of the squares of the real and imaginary parts of the number.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Understanding of the concepts of vectors in space and vector valued functions. 2) Ability to compute derivatives and integrals of vector-valued functions and solve related problems with various applications. Evaluate the behaviors and graphs of functions 3) Ability to compute multiple integrals and use them in various applications ability to compute multiple integrals and use them in various applications. 4) Understanding of the concepts of calculus of multi-dimensional quantities and solve related problems with various applications. 5) Ability to identify, formulates, and solves engineering problems. 6) Understanding that the modulus of a complex number is equal to the square root of the sum of the squares of the real and imaginary parts of the number.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Vectors (16 hrs) • Function of Two and more Variables and Their Derivatives (20hrs) • Multiple Integral (20hrs) • Complex Number (16hrs)

Course Description	A continuation of Calculus I. This is a study of multivariable calculus including vector-valued functions and the calculus of curves in space, differential calculus of multivariate functions, and integral calculus of multivariate functions, spherical and cylindrical coordinates, line and surface integrals.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **72** **In class tests** **6**	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **dorm, home memorizing** **40** **Preparation for tests** **20** **Homeworks** **12**	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	24% (24)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments (Homeworks)	6	16% (16)	2, 4, 6, 10, 12, 14	LO # 1, 2, 3, 4, 5 and 6
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-6
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Vectors , Vector in Space
Week 2	Dot and Cross Products on Vectors
Week 3	Equations for Lines and Planes in Space
Week 4	Function of Two and more Variables and Their Derivatives
Week 5	Partial Derivatives , Chain Rules
Week 6	Gradient and Directional Derivatives
Week 7	Applications of Partial of Derivative (maximum, minimum and saddle point)
Week 8	**Midterm exam**
Week 9	Double integral
Week 10	Double integral in polar coordinates
Week 11	Changing Cartesian integrals into Polar integrals
Week 12	Triple integral (Rectangular, Cylindrical and Spherical)
Week 13	Complex Number , Addition, Subtraction, Multiplication and Division
Week 14	Polar representation of Complex Number
Week 15	Complex Number
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Calculus and analytical geometry, George B. Thomas Jr.; Addison – Wesley publishing company, 7th edition, 1988.**	Yes
Recommended Texts	- Calculus; James Stewart, 10th edition, 2003.	No
Websites	N/A	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	**التقدير**	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		

Module Title	**COMPUTER I**	**Module Delivery**
Module Type	**BASIC**	**Theory** **Lab**
Module Code	**UOT-003**	
ECTS Credits	4	
SWL (hr/sem)	100	

Module Level	1	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100

Administering Department	Electrical Engineering	**College**	Engineering
Module Leader	Dr. Jalal N. Abdulbaqi	**e-mail**	Jalal.abdulbaqi@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	Saad Sami Farhan	**e-mail**	saadsami@tu.edu.iq
Peer Reviewer Name	Dr. Jalal N. Abdulbaqi	**e-mail**	Jalal.abdulbaqi@tu.edu.iq
Review Committee Approval	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, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	The aim of this module is to provide students with a comprehensive understanding of the key concepts and principles of computer science. Through the study of topics such as history, data representation, computer components, algorithms, programming languages, operating systems, applications, internet and networking, and cybersecurity, students will gain a broad understanding of the field of computer science and how it has evolved over time.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Describe the historical development of computer science and its impact on society. 2. Understand the various methods of data representation and manipulation. 3. Identify the components of a computer and their functions. 4. Design and implement algorithms for a range of problems. 5. Understand the principles of programming languages and apply them to develop software. 6. Understand the structure and functions of operating systems. 7. Identify and analyze a range of applications of computer science. 8. Understand the principles of internet and networking technologies. 9. Identify and analyze various cybersecurity threats and methods of prevention.
Indicative Contents المحتويات الإرشادية	- History introduction: Evolution of computer science, pioneers and important milestones - Data representation: Binary numbers, hexadecimal, character sets, ASCII and Unicode - Computer components: CPU, memory, input/output devices, storage devices - Algorithms: Definition, representation, complexity, searching, sorting, optimization - Programming languages: Syntax, semantics, variables, functions, control structures, abstraction - Operating systems: Structure, file systems, process management, memory management

	- Applications: Databases, artificial intelligence, computer graphics, human-computer interaction - Internet and networking: Protocols, network architectures, security, privacy - Cybersecurity: Threats, attacks, prevention, detection, mitigation
Course Description	This course offers students a comprehensive exploration of the fundamental concepts and principles that underpin the field of computer science. By delving into various subjects including the historical development of computing, data representation, computer components, algorithms, programming languages, operating systems, applications, internet and networking, and cyber-security, students will develop a well-rounded understanding of the discipline. By examining the evolution of computer science over time, students will acquire a broad perspective on the field and its significance in contemporary society. Through a combination of theoretical knowledge and practical applications, this module equips students with the necessary foundation to pursue further studies or careers in computer science.

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Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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Strategies	The module will use a range of learning and teaching strategies, including: - **Lectures**: To provide students with an overview of the main concepts and principles. - **Labs**: To provide students with hands-on experience of programming, algorithms, and data representation. - **Assignments and Quizzes**: To provide students with opportunities to apply their knowledge and skills to real-world problems and check their understanding.

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Student Workload (SWL)
الحمل الدراسي للطالب

</div>

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
In class lectures 46 **In Lab Lectures** 14 **In class tests** 3	63		4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Library, dorm, home memorizing 20 **Preparation for tests** 12 **Homeworks** 5	37		2.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	2, 4, 6, 10	LO #1, 3, 5 and 6
	Assignments	6	15% (15)	3, 5, 13, 14	LO # 2, 4, 7 and 8
	Lab	14	15% (15)	Continuous	
Summative assessment	Midterm Exam	2	10% (10)	7	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	History introduction: Evolution of computer science, pioneers and important milestones
Week 2	Data representation: Binary numbers, hexadecimal, character sets, ASCII and Unicode
Week 3	Computer components: CPU, memory, input/output devices, storage devices
Week 4	Algorithms: Definition, representation, complexity, searching, sorting, optimization
Week 5	Programming languages I
Week 6	Programming languages II
Week 7	**Midterm Exam**
Week 8	Operating systems I
Week 9	Operating systems II
Week 10	Applications I: Information Systems
Week 11	Applications II: artificial intelligence
Week 12	Applications III: computer graphics, human-computer interaction
Week 13	Networking
Week 14	Internet
Week 15	Cybersecurity: Threats, attacks, prevention, detection, mitigation
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Lab 1: Computer Operating System (e.g. Microsoft Windows)
Week 2	Lab 2: Document Processing I (e.g. Microsoft Word)
Week 3	Lab 3: Document Processing II (e.g. Microsoft Word)
Week 4	Lab 4: Data Processing I (e.g. Microsoft Excel)
Week 5	Lab 5: Data Processing II (e.g. Microsoft Excel)
Week 6	Lab 6: Presentation Slides I (e.g. Microsoft PowerPoint)
Week 7	Lab 7: Presentation Slides II (e.g. Microsoft PowerPoint)

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Computer Science Illuminated, by Dale, N and Lewis, J, 7th Ed, Jones & Bartlett Learning, 2020**	No
Recommended Texts	-	-
Websites	-	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	ENGINEERING DRAWING	**Module Delivery**
Module Type	SUPLEMENT	
Module Code	ENG-101	Theory
ECTS Credits	6	Lecture Practical
SWL (hr/sem)	150	Project

Module Level	1	Semester (s) offered	1
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Waleed M. Sh. Alabdraba	**e-mail**	walabdraba@tu.edu.iq
Module Leader's Acad. Title	Professor	**Module Leader's Qualification**	Ph.D
Module Tutor	Qusay Oglah Salih	**e-mail**	Qusay.o.salih@tu.edu.iq
Peer Reviewer Name	Nizar N. Ismaeal	**e-mail**	Dr.nizar1961@tu.edu.iq
Review Committee Approval	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, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1. Learn how to use the AutoCAD program effectively. 2. Develop skills to create 2D drawings using fundamental geometric elements, including lines, circles, and rectangles …etc.). 3. Learn to modify, edit the 2D drawing (move, copy, mirror…etc.). 4. Understand how to accurately apply dimensions to 2D drawings for precise representation and clarity. 5. Gain the ability to create 3D drawings using basic geometric shapes and elements. 6. Develop skills to modify and edit 3D drawings, including moving and copying elements effectively (move, copy… etc.)
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of this course students will be able to: 1.Understand fundamental of the AutoCAD drawings, engineering drawings. 2. analyze and draw any engineering drawing using the facilities that the AutoCAD program produce such as using basic elements (line, circle, rectangular…etc.). 3. Modify any drawing using the tools (move, copy, mirror, offset, array, etc.) 4. The student could add the dimensions to the drawing after complete the 2D drawing. 5. Design and draw any engineering drawing using any AutoCAD Program Version. 6. Draw any drawing using different methods, techniques and facilities submitted by the AutoCAD program.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Introduction to Drawing Equipment (6hrs) • Geometrical Construction (18hrs) • Orthographic Projection (18hrs) • Sectional views(18hrs) • Isometric Projections(21hrs) • Dimensioning(9hrs) Indicative content includes the following. Part A – Traditional drawing and 2D Drawings 1. analyze and draw any engineering drawing 2D using the facilities

	that the AutoCAD program produce such as using basic elements (line, circle, rectangular...etc.). [30 hrs] 2. Modify any drawing using the tools (move, copy, mirror, offset, array, etc.)[24 hrs] 3. add the dimensions to the drawing [6 hrs] Part B – 3D drawings 1. analyze and draw any engineering drawing 3D using the facilities that the AutoCAD program produce such as using basic elements [12hrs] 2. Learn to modify, edit the 3D drawing (move, copy, mirror...etc.). [12 hrs] 3. Learn to add dimensions to the 3D drawings. [6 hrs]
Course Description	An engineering drawing course focuses on usage of drawing instruments, lettering, construction of geometric shapes, etc. Students study use of dimensioning, shapes and angles or views of such drawings. Dimensions feature prominently, with focus on interpretation, importance and accurate reflection of dimensions in engineering drawing. Other areas of study in this course may include projected views and development of surfaces..

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 90 **In class tests** 3	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 22 **Preparation for tests** 15 **HomeWorks** 20	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (26)	7 and 10	LO #1, 2, 3, and 4
	Online Assignments	3	6% (6)	2, 5, and7	LO # 1, 2, 3, 4, 5 and 6
	Onsite Assignments	10	10%(10)	All	LO # 1, 2, 3, 4, 5 and 6
	Project		4%(4)	11	
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to engineering drawing: 6 hrs: in drawing studio: onsite assignment
Week 2	Engineering projections 6 hrs: in drawing studio: onsite assignment online assignment
Week 3	Introduction to AutoCad: 6 hrs: 3 hrs in Classroom 3 hrs in Computer Station Lab: No assignments
Week 4	The sketching concepts such as how to create basic geometric shapes, lines and arcs using drawing tools. 6 hrs: 3 hrs in Classroom 3 hrs in Computer Station Lab :
Week 5	Drawing aids help users in creating systematic and symmetrical drawings. 6 hrs : 3 hrs in Classroom 3 hrs in Computer Station Lab : onsite assignments online assignment
Week 6	Editing and modification of sketched objects by using editing commands such as move, rotate, copy, scale, trim and extent are taught here. 6 hrs: 3 hrs in Classroom 3 hrs in Computer Station Lab : onsite assignments
Week 7	Students learn to organize their drawings by creating layers. Assigning objects to specific layers better visibility and control. 6 hrs: 3 hrs in Classroom 3 hrs in Computer Station Lab : Quiz, online assignment
Week 8	Midterm exam
Week 9	2D drawings use complex tools and techniques with which students create detailed floor plans. 6 hrs: 3 hrs in Classroom 3 hrs in Computer Station Lab : onsite assignments
Week 10	2D drawings use complex tools and techniques with which students create detailed elevation and section views. 6 hrs: 3 hrs in Classroom 3 hrs in Computer Station Lab : Quiz
Week 11	3D models are created using extrusion, and lofting. 6 hrs: 3 hrs in Classroom 3 hrs in Computer Station Lab : Project
Week 12	3D models are created using revolving and other 3D modelling commands. 6 hrs: 3 hrs in Classroom 3 hrs in Computer Station Lab : onsite assignments
Week 13	In hatching, closed boundaries are filled with patterns or textures. 6 hrs: 3 hrs in Classroom 3 hrs in Computer Station Lab : onsite assignments

Week 14	Students are taught to apply hatching to represent materials, sections or other design elements in the drawings. 6 hrs: 3 hrs in Classroom 3 hrs in Computer Station Lab : onsite assignments
Week 15	Review
Week 16	**Final Exam (35% practical, 15% written)**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction to engineering drawing: 6 hrs: in drawing studio:
Week 2	Engineering projections 6 hrs: in drawing studio:
Week 3	Introduction to AutoCad: 3 hrs in Computer Station Lab:
Week 4	The sketching concepts such as how to create basic geometric shapes, lines and arcs using drawing tools. 3 hrs in Computer Station Lab :
Week 5	Drawing aids help users in creating systematic and symmetrical drawings. hrs in Computer Station Lab :
Week 6	Editing and modification of sketched objects by using editing commands such as move, rotate, copy, scale, trim and extent are taught here. 3 hrs in Computer Station Lab :
Week 7	Students learn to organize their drawings by creating layers. Assigning objects to specific layers better visibility and control. 3 hrs in Computer Station Lab :
Week 8	Midterm exam
Week 9	2D drawings use complex tools and techniques with which students create detailed floor plans. 3 hrs in Computer Station Lab :
Week 10	2D drawings use complex tools and techniques with which students create detailed elevation and section views. 3 hrs in Computer Station Lab :
Week 11	3D models are created using extrusion, and lofting. 3 hrs in Computer Station Lab :
Week 12	3D models are created using revolving and other 3D modelling commands 3 hrs in Computer Station Lab :
Week 13	In hatching, closed boundaries are filled with patterns or textures 3 hrs in Computer Station Lab :
Week 14	Students are taught to apply hatching to represent materials, sections or other design elements in the drawings. 3 hrs in Computer Station Lab :
Week 15	Review

	Learning and Teaching Resources مصادر التعلم والتدريس	
	Text	**Available in the Library?**
Required Texts	Text book 1: James A. Leach, "AutoCad 2002 companion", 2003. Text book 2: Drawing by computer AutoCAD 2011	Yes
Recommended Texts	Text book 3: AutoCAD 2D Tutorials, AutoCAD 2013, By Kristen S. Kurland, 2012.	No
Websites	https://www.autodesk.com.au/campaigns/autocad-tutorials	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	ENGINEERING MECHANICS	**Module Delivery**
Module Type	BASIC	
Module Code	ENG- 102	Theory Tutorial
ECTS Credits	5	
SWL (hr/sem)	125	

Module Level	1	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Mechanical Engineering	**College**	Engineering
Module Leader	Sabah Mahdi Salih	**e-mail**	sabahmahdi@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	MSc
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. Ahmed Faaiq Sultan	**e-mail**	Ahmed.f.sultan@tu.edu.iq
Review Committee Approval	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, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1) To provide definition of force and moment vectors and give necessary vector algebra 2) To explain the concept of equilibrium of particles and rigid bodies in plane and 3D space 3) To give information about support types and to give ability to calculate support reactions 4) To explain the equilibrium of structures and internal forces in trusses, and frames 5) To give information about distributed loads 6) To explain centroid of bodies and Figures. 7)To provide information on moment of inertia
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Use both conceptual and numerical techniques to solve engineering problems. 2) Analyze and develop free-body diagrams for any system of forces in two and three dimensions. 3) Understand and use the general idea of equilibrium of a particle. 4) Understand and use the general ideas of force system resultants. 5) Determine the moment of a force about an arbitrary point and/or axes 6) Analyze the equilibrium of rigid bodies under any system of forces. 7) Analyze trusses, beams, frames, and machines. 8) Calculate center of gravity, centroids, and moments of inertia. 9) Apply friction forces and analyze their different applications.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Force Vectors (8 hrs) • Force System Resultants (8 hrs) • Equilibrium of a Rigid Body (8 hrs) • Friction (8 hrs) • Center of Gravity and Centroid (6 hrs) • Moments of Inertia and virtual work (8 hrs) • Structure (trusses and Frames) (10 hrs)
Course Description	The course covers the following topics; statics of particles: forces in plane, forces in space, equilibrium, moment of a force, moment of a couple, equivalent systems of forces on rigid bodies, equilibrium in two dimensions, equilibrium in three dimensions, distributed forces: centroids and center of gravity, analysis of structures: trusses, frames and machines, internal forces

	in beams and cables, friction, moments of inertia of areas, moments of inertia of masses.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures 50 In class tests 5 Seminars 4 Discussions 4	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 30 Preparation for tests 20 Homeworks 12	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments (Homeworks)	5	15% (15)	2, 4, 6, 8, 10	LO # 1, 2, 3, 4, 5 and 6
	Discussions	6	15% (15)	Continuous	
Summative assessment	Midterm Exam	2	10% (10)	7	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

	Delivery Plan (Weekly Syllabus)
	المنهاج الاسبوعي النظري
	Material Covered
week1	General principles, Principles of statics, vectors
Week 2	Planar forces, resultant of a force system
Week 3	Planar forces, resultant of a force system
Week 4	The free body diagram, definition of moment, moment of a couple
Week 5	The free body diagram, definition of moment, moment of a couple
Week 6	Equilibrium in 2-D, free body diagrams, equations of equilibrium
Week 7	**Midterm exam**
Week 8	Equilibrium in 3-D, free body diagrams, equations of equilibrium
Week 9	STRUCTURES Trusses and frames
Week 10	STRUCTURES Trusses and frames
Week 11	Center of mass, Gravity and centroid
Week 12	Centroids of Lines, Areas, and Volumes
Week 13	Moments of inertia
Week 14	Moments of inertia
Week 15	Friction (dry friction)
Week 16	**Final Exam**

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Engineering Mechanics-Statics, J.L.Meriam, L.G.Kraige, Wiley, 5th Edition, 2003, ISBN: 0-471-26607-8**	Yes
Recommended Texts	**Engineering Mechanics-Statics, Hibbeler, R.C.13th Edition, Pearson Prentice Hall, 2016, ISBN 978-0-13-31892-2."**	yes
Websites	N/A	

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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Fail Group (0 – 49)	**FX –** Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

<table>
<tr><td colspan="4" align="center">**Module Information**
معلومات المادة الدراسية</td></tr>
<tr><td>**Module Title**</td><td>ENGINEERING WORKSHOPS</td><td colspan="2">**Module Delivery**</td></tr>
<tr><td>**Module Type**</td><td>CORE</td><td colspan="2" rowspan="4">**Theory**
Practical</td></tr>
<tr><td>**Module Code**</td><td>ENG-106</td></tr>
<tr><td>**ECTS Credits**</td><td>6</td></tr>
<tr><td>**SWL (hr/sem)**</td><td>150</td></tr>
<tr><td>**Module Level**</td><td>1</td><td>**Semester (s) offered**</td><td>1</td></tr>
<tr><td>**Min number of students**</td><td>15</td><td>**Max number of students**</td><td>100</td></tr>
<tr><td>**Administering Department**</td><td>Environmental Engineering</td><td>**College**</td><td>Engineering</td></tr>
<tr><td>**Module Leader**</td><td>Abd fares Ali</td><td>**e-mail**</td><td>abdfaris@tu.edu.iq</td></tr>
<tr><td>**Module Leader's Acad. Title**</td><td>Lecturer</td><td>**Module Leader's Qualification**</td><td>MSC.</td></tr>
<tr><td>**Module Tutor**</td><td>Mahmoud Shukri Dirar</td><td>**e-mail**</td><td>mahmoed_alosi@yahoo.com</td></tr>
<tr><td>**Peer Reviewer Name**</td><td>Abbas Ali & Qais k. Shaakir</td><td>**e-mail**</td><td>Kanoosh.abbasali@tu.edu.iq / qshaakir@tu.edu.iq</td></tr>
<tr><td>**Review Committee Approval**</td><td>01/06/2023</td><td>**Version Number**</td><td>1.0</td></tr>
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<table>
<tr><td colspan="4" align="center">**Relation With Other Modules**
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>**Prerequisite module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
<tr><td>**Co-requisites module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
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Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	Theoretical and practical training in which the student is scientifically and technically established with the most necessary skills in the field of engineering technology
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of this course students will be able to: Knowledge of technical skills in the field of industrial safety, measurement, filing, carpentry, welding, mechanical operation, sanitary engineering and the basics of electrical work
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. ● Industrial safety workshop(2 hours) ● Measurement &Marking workshop(3 hours) ● Filing workshop (10 hours) ● Carpentry workshop(10 hours) ● Welding workshop(10 hours) ● Casting workshop(10 hours) ● Machining workshop(10 hours) ● plumbing workshop(10 hours) ● Electrical workshop (10 hours)
Course Description	The engineering workshop course focuses on identifying risks in the work environment and industrial safety guidelines. And training on how to measure and determine, and the use of filing tools and their work. Learn about the types of wood used in carpentry, the process of shaping it, and the use of carpentry tools and machines. Training in welding work, its types, and the process of joining metals by welding. Training on various casting works and training on mechanical operation, which includes turning, milling, and grinding. Training on pipe knowledge, how to connect, sanitary engineering works, and training on the basics of electrical workshops.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)

الحمل الدراسي للطالب				
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
In class lectures	30			
In Lab Lectures	45			
In class tests	3			
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Library, dorm, home memorizing	22			
Preparation for tests	10			
Preparation for Reports	20			
Homeworks	20			
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل		150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	9	10% (10)	all	LO #1, 2, 3, and 9
	Assignments	9	15% (15)	All	LO # 1, 2, 3, 4, 5 and 9
	Reports	15	15% (15)		
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Industrial safety workshop & Measurement and marking workshop
Week 2	Filing workshop
Week 3	Filing workshop
Week 4	Carpentry workshop
Week 5	Carpentry workshop
Week 6	Welding workshop
Week 7	Welding workshop , **Midterm Exam**
Week 8	plumbing workshop

Week 9	plumbing workshop
Week 10	Machining workshop
Week 11	Machining workshop
Week 12	Casting workshop
Week 13	Casting workshop
Week 14	Electrical workshop
Week 15	Electrical workshop
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Measurement and marking workshop
Week 2	Filing workshop
Week 3	Filing workshop
Week 4	Carpentry workshop
Week 5	Carpentry workshop
Week 6	Welding workshop
Week 7	Welding workshop
Week 8	plumbing workshop
Week 9	plumbing workshop
Week 10	Machining workshop
Week 11	Machining workshop
Week 12	Casting workshop
Week 13	Casting workshop
Week 14	Electrical workshop
Week 15	Electrical workshop

Learning and Teaching Resources

مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Abd fares ,** Engineering workshops	Yes
Recommended Texts	Technology of Machine Tools , Steve F. Krar & J. William Oswald ,McGraw-Hill Publishing Company , fourth Edition , 1991	No
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information

معلومات المادة الدراسية

Module Title	ENGLISH LANGUAGE I	Module Delivery	
Module Type	SUPPORTIVE	Theory	
Module Code	UOT-002		
ECTS Credits	2		
SWL (hr/sem)	50		
Module Level	1	Semester (s) offered	2
Min number of students	15	Max number of students	100
Administering Department	ENVIRONMENTAL ENGINEERING	College	ENGINEERING
Module Leader	ASST.PROF. AHMED S. ABDULLAH	e-mail	AHMEDSUBHI1981@TU.EDU.IQ
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Review Committee Approval	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, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	Installing the basic and advanced techniques of learning English for the students to get the skills of having a well-formed competence that helps to make English as easy for students as their mother tongue language Improving the fourth skills of learning any language which are speaking , listening , writing and reading which help in producing a well English user after graduation. Encouraging students to keep talking in English among them in daily life
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Cognitive goals 2. Developing the learning competence of getting a new language. 3. Setting the requirements and grammatical resemblance among languages. 4. The skills goals special to the programme . 5. Writing and reading skills . 6. speaking and listening skills.
Indicative Contents المحتويات الإرشادية	- Am/is/are, This is, What's this in English, Numbers, Practising conversations, morning expressions - He,she,they, his/her, questions, countries, adjectives, nouns, reading and speaking, numbers - Negatives, questions, short answers, jobs, personal info, roleplay, social expressions (1) - Possessive adjectives, possessives, has/have, adj+noun, the family, listening, the alphabet , on the phone. - Present simple I / we/ you/ they, a and an, sports/food/ drinks, adjectives, verbs, language and nationalities, roleplay, how much is it - Present simple he/she/it, adverbs of frequency, the time, words that go together, lifestyle questionnaire, days of week, prepositions of time - Question words, pronouns, this and that, opposite adjectives, places, reading and writing, can I ?. - There is/ are, prepositions, rooms and furniture, in and out of town, vocabulary, directions - Was/were born, past simple-irregular verbs, saying years, people and jobs, have/do/go, when's your birthday? - past simple –regular and irregular, ago, weekend activities, time expressions, seasons, making conversation, going sightseeing - Can/can't, requests and offers, verb+noun, adj+noun, opposite adjectives, everyday problems - I'd like, some and any, like and would like, shopping, food, in a restaurant, listening, signs all around - Present continuous , present simple and present perfect, colors, reading and listening, what's the matter

	- Future plans, clothes, opposite verbs, social expressions (2), reading and speaking - Revision, transport, a mini autobiography, roleplay, showing interest
Course Description	This Course provides a concise summary of the main features of the course and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The module will use a range of learning and teaching strategies, including: - **Lectures**: To provide students with an overview of the main concepts and principles. - **homeworks and communicative interaction**: To keep students in touch with the topics theoritcally and practically - **Assignments and Quizzes**: To provide students with opportunities to apply their knowledge and skills to real-world English language problems and check their understanding.

Student Workload (SWL)
الحمل الدراسى للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In Class Lectures** 30 **In class tests** 3	33	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20% (20)	2, 4, 6, 10	LO #1, 3, 5 and 6
	Homeworks	6	10% (10)	3, 5, 13, 14	LO # 2, 4, 5 and 6
	Discussion and activities	7	10% (10)	continuous	All
Summative assessment	Midterm Exam	2	10% (10)	8	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	English tenses I, reading comprehension, Listening samples, discussion
Week 2	Passive and active voice, writing CV, common speech utterances, discussion
Week 3	Negation in English, writing cover letter, listening comprehension, discussion
Week 4	How to write paragraphs, writing style, informal and formal speech, discussion
Week 5	Phrasal verbs, scanning reading, extracting summeries, discussion
Week 6	Normal dictuonary and technical dictionary, consonents and vowels, syllables
Week 7	Overall Review and feedback
Week 8	**Midterm Exam**
Week 9	Group workshops, given tasks, speaking and listening discussion among groups
Week 10	Video samples and questions, written tasks, cheking pronounciation
Week 11	Homework reports, direct and indirect speech, how to write a report
Week 12	Main , mid and final sentences in a paragraph. Style of writing, reading check
Week 13	Utterances and sentences, how to dilever your message, hidden intentions in communication
Week 14	Importance of social communication, how to keep communicatin with others to improve English
Week 15	Revision, group works, cheking results
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Series of : New Headway Plus (student book & work key book) for 1st, 2nd,3rd & 4th Classes . By Aurhors: John and Liz Soars**	yes
Recommended Texts	**Principles of grammar: Murphy**	-
Websites	**none**	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			

Module Title	ENVIRONMENTAL CHEMISTRY	Module Delivery	
Module Type	CORE	**Lecture** **Laboratory**	
Module Code	ENVR-ENG-101		
ECTS Credits	7		
SWL (hr/sem)	175		

Module Level	1	Semester (s) offered	1
Min number of students	15	Max number of students	100
Administering Department	Environmental Engineering	College	Engineering
Module Leader	Dr. Nadia Nazhat Sabeeh	e-mail	eng.nadianazhat@tu.edu.iq
Module Leader's Acad. Title	Assist.Professor	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name	Dr. Waleed M. Sh. Alabdraba	e-mail	walabdraba@tu.edu.iq
Review Committee Approval	01/06/2023	Version Number	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	Analytical Chemistry	**Semester**	2

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	Enable students to understand the most important environmental problems of today, such as water and wastewater treatment, surface water and groundwater contamination, hazardous waste management, radioactive waste management, acid rain, air toxics emission, ozone depletion, and global climate change. Fundamental understanding of chemistry helps in understanding these problems and development of processes to minimize or eliminate them.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Understanding the basic Concepts of Environmental Chemistry. 2-Understanding the difference between Heat and Work, Enthalpy, Entropy, and Free energy. 3- Apply the chemical concepts to find the first ionization constant and solubility product at different temperatures. 4- Learn the principle of membrane processes, electrochemistry, chemical kinetics and isotherms.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. - Introduction to Engineering and pollution (2hrs) - Fundamentals of Chemistry for Environmental Engineering and Science (4 hrs) - Basic concepts for thermodynamics, heat and work, enthalpy, entropy, free energy, Binary mixtures (10 hrs) - Membane Processes, electrochemistry and chemical Kinetics (10 hrs) - Adsorption (4 hrs)
Course Description	This course aims to establish fundamental knowledge of environmental chemistry. Presentation of the course starts by introducing the most important environmental problems of today. The most crucial topics that aid in understanding and solving these problems are then studied.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The learning and teaching strategy is designed to: Carefully cover essential materials and analytical techniques in the lectures, demonstrate concepts with appropriate (and practical where possible) examples allow students sufficient time to practice the techniques needed to understand the most important environmental problems and how to examine them.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
In class lectures	30			
Lab	45			
Final test	3			
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		97	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.47
Library, dorm, home memorizing	25			
Prepartion for reports	33			
Prepartion for tests	24			
Homeworks	15			
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل		175		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	12% (12)	3, 6, 9, 13	LO #1, 2, 3, and 4
	Assignments • Home works • Lab. Reports • Discussion	4 15 3	8% (8) 15% (15) 5% (5)	4, 6, 10, 12 All All	LO # 1, 2, 3, and 4
Summative assessment	Midterm Exam	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to engineering and pollution
Week 2	Fundamentals of Chemistry for Environmental Engineering and Science
Week 3	Air pollution and global environmental change, , continued.
Week 4	Basic concepts from Physical chemistry
Week 5	Entropy, continued, Free energy
Week 6	Temperature dependence of equilibrium constant

Week 7	Midterm exam
Week 8	Vapor pressure of liquids and surface tension
Week 9	Binary mixtures
Week 10	Membrane processes
Week 11	Electrochemistry
Week 12	Chemical Kinetics
Week 13	Chemical Kinetics, continued
Week 14	Adsorption
Week 15	Adsorption, continued
Week 16	Final Exam

Environmental chemistry (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Volumetric measurement Glassware
Week 2	Lab 2: Laboratory safety
Week 3	Lab 3: Determination of pH
Week 4	Lab 4: Determination of PO_4
Week 5	Lab 5: Determination of SO_4
Week 6	Lab 6: Determination of Acidity
Week 7	Lab 7: Determination of Alkalinity
Week 8	Lab 8: Determination of Alkalinity, Continued
Week 9	Lab 9: Determination of NO_3
Week 10	Lab 10: Determination of Iron and Manganese in Water
Week 11	Lab 11: Determination of Iron and Manganese in Water , Continued
Week 12	Lab 12: Determination of Sulphate and Sulphide in Water
Week 13	Lab 13: Determination of Sulphate and Sulphide in Water, Continued
Week 14	Lab 14: Determination of Conductivity
Week 15	Lab 15: Adsorption of methylene blue on activated carbon

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1- Chemistry for Environmental Engineering and Science. Fifth Edition by Clair N. Sawyer, Perry L. McCarty, Gene F. Parkin, 2003 Publisher: McGraw – Hill.	Yes
Recommended Texts	ENGINEERING THERMODYNAMICS, Third edition by R .K. RAJPUT, 2007, LAXMI PUBLICATIONS (P) LTD.	No
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	ENVIRONMENTAL PHYSICS	Module Delivery	
Module Type	CORE		
Module Code	ENVR-ENG-103	**Theory** **Tutorial** **discussion**	
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	1	Semester (s) offered	2
Min number of students	15	Max number of students	100
Administering Department	Environmental Engineering	College	Engineering
Module Leader	Dr. Salwa H. Ahmed	e-mail	dr.salwahadi@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	-
Peer Reviewer Name	Prof.Dr. Waleed M. Sh. Alabdraba	e-mail	walabdraba@tu.edu.iq
Review Committee Approval	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	-

<table>
<tr><td colspan="2">Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر</td></tr>
<tr>
<td>Module Aims
أهداف المادة الدراسية</td>
<td dir="rtl">• فهم كيفية تطبيق الديناميكا الحرارية الأساسية على البيئة البشرية ،
• فهم التكوين الأساسي والهيكل وديناميكيات الغلاف الجوي ،
• شرح طريقة عمل الدورة الهيدرولوجية ومناقشة آليات نقل المياه في الغلاف الجوي وفي باطن الأرض ،
• مناقشة مشاكل بيئية محددة مثل التلوث الضوضائي واستنفاد الأوزون والاحتباس الحراري في سياق فهم شامل لديناميكيات الغلاف الجوي ،
• مناقشة مشاكل الطلب على الطاقة وشرح المساهمات المحتملة لمصادر الطاقة المتجددة في إمدادات الطاقة
• فهم العديد من الموضوعات المختلفة الأخرى لبيئتنا.</td>
</tr>
<tr>
<td>Module Learning Outcomes

مخرجات التعلم للمادة الدراسية</td>
<td dir="rtl">1. التعرف على المفاهيم الفيزيائية الأساسية التي تؤثر على البيئة
2. اشرح مبادئ وعمليات نقل الطاقة, الاشعاع, البقاء في المناخات الباردة والحارة, التلوث الضوضائي
3. معرفة مكونات الغلاف الجوي والاشعاع, هيكل وتكوين الغلاف الجوي, الضغط الجوي
4. دراسة الماء والغلاف المائي, الدورة الهيدروجينية, فيزياء تكوين السحب والغيوم, العواصف الرعدية
5. دراسة الرياح, فيزياء خلق الرياح, القوى الرئيسية المؤثرة على الكتل الهوائية
6. معرفة فيزياء الارض, دورة التربة والهيدرولوجيا, تدفق المياه وتبخرها</td>
</tr>
<tr>
<td>Indicative Contents
المحتويات الإرشادية</td>
<td>Indicative content includes the following:
• Environmental Physics Principles and Concepts (12 hrs.)
• Environmental Physics Issues in Waste Management (12hrs.)
• Natural Physical Hazards (18 hrs.)
• The Human-Earth System Relationship (3hrs.)</td>
</tr>
<tr>
<td>Course Description</td>
<td dir="rtl">فهم جوانب الفيزياء التي تسود العمليات البيئية في حياتنا اليومية وفي الظواهر الطبيعية. بالإضافة الى فهم بعض المهارات الرياضية الأساسية اللازمة لتطبيق الديناميكا الحرارية الأساسية على البيئة البشرية ، فهم التكوين الأساسي والهيكل وديناميكيات الغلاف الجوي مع شرح طريقة عمل الدورة الهيدرولوجية ومناقشة آليات نقل المياه في الغلاف الجوي وفي باطن الأرض ومناقشة مشاكل بيئية محددة مثل التلوث الضوضائي واستنفاذ الأوزون والاحتباس الحراري في سياق فهم شامل لديناميكيات الغلاف الجوي</td>
</tr>
<tr><td colspan="2">Learning and Teaching Strategies
استراتيجيات التعلم والتعليم</td></tr>
<tr>
<td>Strategies</td>
<td>The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.</td>
</tr>
</table>

<table>
<tr><td colspan="4" align="center">Student Workload (SWL)
الحمل الدراسي للطالب</td></tr>
<tr>
<td>Structured SWL (h/sem)
الحمل الدراسي المنتظم للطالب خلال الفصل
In class lectures   42
Discussion   3
In class tests   3</td>
<td>48</td>
<td>Structured SWL (h/w)
الحمل الدراسي المنتظم للطالب أسبوعيا</td>
<td>3.2</td>
</tr>
<tr>
<td>Unstructured SWL (h/sem)
الحمل الدراسي غير المنتظم للطالب خلال الفصل
Library, dorm, home memorizing 22
Preparation for tests   15
Homework   15</td>
<td>52</td>
<td>Unstructured SWL (h/w)
الحمل الدراسي غير المنتظم للطالب أسبوعيا</td>
<td>3.47</td>
</tr>
<tr>
<td>Total SWL (h/sem)
الحمل الدراسي الكلي للطالب خلال الفصل</td>
<td colspan="3">100</td>
</tr>
</table>

Module Evaluation
تقييم المادة الدراسية

		Time (hr.)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	12%(20)	2,4,6,8,10,12	LO # 1, 2, 3, and 4
	Assignments	6	20%(20)	3,5,9,11,13	LO # 1, 2, 3, 4 and 5
	Discussion	3	8%(8)	Continuous	
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1, 2, and 3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	المقدمة ,البيئة البشرية, قوانين الديناميكا الحرارية. مسائل
Week 2	عمليات نقل الطاقة, الاشعاع, البقاء في المناخات الباردة والحارة, التلوث الضوضائي, مسائل
Week 3	الغلاف الجوي والاشعاع, هيكل وتكوين الغلاف الجوي, الضغط الجوي , سرعة الهروب, مسائل
Week 4	الاوزون, ثقب الاوزون, الاشعاع الارضي, الارض كجسم اسود
Week 5	الاحتباس الحراري وتأثيره, حل مسائل
Week 6	الماء والغلاف المائي, الدورة الهيدروجينية
Week 7	**Midterm Exam**
Week 8	فيزياء تكوين السحب والغيوم, العواصف الرعدية , حل المسائل
Week 9	الرياح, فيزياء خلق الرياح, القوى الرئيسية المؤثرة على الكتل الهوائية, حل المسائل
Week 10	قوة الاحتكاك, حل المسائل
Week 11	الاعاصير والاعاصير المضادة, حل المسائل
Week 12	فيزياء الارض, دورة التربة والهيدرولوجيا, تدفق المياه وتبخرها
Week 13	طاقة العيش , الوقود الاحفوري, الطاقة النووية
Week 14	الموارد المتجددة, الطلب على الطاقة والمحافظة عليها
Week 15	نقل الحرارة والعزل الحراري, فقدان الحرارة في المباني
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	Nigel Mason and Peter Hughes: Introduction to Environmental Physics: Planet Earth, Life and Climate, Taylor and Francis, 2001	No
Recommended Texts		No

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	حقوق الانسان والديمقراطية	**Module Delivery**
Module Type	SUPLEMENT	محاضرات نظرية مناقشات
Module Code	**UOT-004**	
ECTS Credits	2	
SWL (hr/sem)	50	

Module Level	1	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Sabah Mahdi Salih	**e-mail**	sabahmahdi@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	MSc
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Ahmed Hussein khunfas	**e-mail**	ahmed.husain@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	لايوجد	**Semester**	-
Co-requisites module	لايوجد	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1-القدرة على ادراك المفهوم الاساسي لحقوق الانسان والطفل والديمقراطية. 2- القدرة على فهم الاصول التاريخية للمفهومين. ومعرفة ايجابيات وسلبيات حقوق الانسان والديمقراطية. 3- الاطلاع على حقوق الانسان والطفل والديمقراطية في الاسلام. 4- التعرف على مصادر حقوق الانسان والطفل وخصائص وسمات الديمقراطية. 5—معرفة اثر التطور التكنولوجي على حقوق الانسان والطفل والديمقراطية. 6-التطرق لمفاهيم ذات صلة بالمصطلحين مثل (العولمة، مؤسسات المجتمع المدني ، الانتخابات والاستفتاء ، الحكم الرشيد ، الجرائم الانسانية، الدستور). 7-الاطلاع على الضمانات التي تكفل حقوق الانسان والطفل وتكفل النظام الديمقراطي والحقوق والحريات العامة.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- التعرف على المصطلحات ذات الصلة بمفهوم حقوق الانسان والطفل والديمقراطية. 2- التعرف على اهم الحقوق التي كفلها الإسلام للإنسان والطفل واستثمارها في معالجة الآفات والحالات السلبية التي تغزو المجتمعات في العصر الحالي . الاستفادة من مزايا الديمقراطية ومكوناتها في معالجة التذبذب وعدم الاستقرار في المجتمع والحفاظ على الاستقرار والسلم المجتمعي. 3- الاطلاع على المواثيق الدولية المختصة بمجالات حقوق الانسان والطفل الصادرة عن المنظمات الدولية وجمعية الأمم المتحدة. 4- الاستفادة من تجارب الاخرين (الدول المتقدمة في مجالات حقوق الانسان والطفل والديمقراطية). 5- اللمام بالقوانين والدساتير الدولية والإقليمية والمحلية المختصة بقضايا حقوق الانسان والحريات العامة والديمقراطية. 7- التعرف على جرائم الإبادة الجماعية والجرائم الإنسانية ومدى تأثيرها على مفهوم حقوق الانسان والطفل والديمقراطية.
Indicative Contents المحتويات الإرشادية	يتضمن المحتوى الارشادي مايأتي: 1- حقوق الانسان والطفل والديمقراطية في الحضارات القديمة والإسلام (8 ساعات). 2- مصادر حقوق الانسان العالمية والمحلية، خصائص وسمات الديمقراطية (4 ساعات). 3- ضمانات حقوق الانسان العالمية والمحلية وضمانات النظام الديمقراطي (4 ساعات). 4- حقوق الانسان والطفل والديمقراطية واثر التقدم التكنولوجي عليهما (4 ساعات). 5- العولمة ، مؤسسات المجتمع المدني ، الانتخابات والاستفتاء، الدستور(4 ساعات) 6- الجرائم الإنسانية وانواعها ، الحكم الرشيد ، (2 ساعة). 7- الوثائق الدولية الخاصة بحقوق الطفل والديمقراطية المعاصرة (4 ساعات).
Course Description	حقوق الانسان: هي حقوق يتمتع بها جميع مكونات البشر لمجرد اننا من ابناء البشر, وهذه الحقوق متأصلة في جميع البشر مهما كان عرقهم او جنسهم او قوميتهم او مذهبهم ولاتمنح من أي دولة، وتتضمن حقوق الانسان والطفل في الحضارات القديمة والاسلام، المواثيق الدولية ، مصادر وضمانات حقوق الانسان ، القوانين والدساتير ، مجلس حقوق الانسان، العولمة، التقدم التكنولوجي واثره على حقوق الانسان. الديمقراطية: يرجع مصطلح الديمقراطية الى الحضارة اليونانية القديمة وهي عبارة عن مصطلح مكون من مقطعين هما: (Cratia) التي تعني حكم و (Demo) التي تعني الشعب ليصبح المفهوم حكم الشعب ، وتتضمن الديمقراطية التطرق الى مفهومها ومعرفة الجذور التاريخية لها ، المكونات ، الخصائص ، المميزات ، الضمانات ، علاقة الديمقراطية ب (الدستور ، مؤسسات المجتمع المدني ، حقوق الانسان ، الحكم الرشيد، الانتخابات) ، الديمقراطية المعاصرة

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	تم وضع استراتيجية التعلم والتعليم من اجل ان يحصل الطالب على معلومات كاملة تغطي المنهج الدراسي المعد للمادة ولكي تتحقق الغاية الاساسية للمنهج الذي ينصب نحو المام وادراك الطالب بالمفاهيم الاساسية لحقوق الانسان والديمقراطية ، والاطلاع على المصادر والضمانات والمواثيق الدولية للمصطلحين من اجل استثمارها في معالجة الظواهر السلبية في المجتمع والحفاظ على الاستقراروالسلم المجتمعي .

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures**　　　　30 **In class tests**　　　　　3	33	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	17	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	1.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	50		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	15% (20)	3, 5, ,7, 9,11,13,	LO #1, 2,3,........., 7
	Assignments	6	15% (15)	2, 4, 6, 10,12,14	LO # 1, 2, 3, ...,7
	Discussions	7	10% (5)	Continuous	
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-7
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	الجذور التاريخية لحقوق الانسان والديمقراطية في الحضارات القديمة
Week 2	حقوق الانسان والطفل والديمقراطية في الاسلام
Week 3	مصادر حقوق الانسان على المستوى الخارجي الدولي، سمات وخصائص الديمقراطية
Week 4	مصادر حقوق الانسان على المستوى الداخلي المحلي، مزايا الديمقراطية
Week 5	ضمانات حقوق الانسان على المستوى المحلي، مكونات الديمقراطية
Week 6	ضمانات حقوق الانسان على المستوى الدولي، الضمانات التي تكفل النظام الديمقراطي
Week 7	مجلس حقوق الانسان، الانتخابات واهميتها

Week 8	امتحان نصف الفصل
Week 9	التطور التكنولوجي واثره على حقوق الانسان والطفل والديمقراطية
Week 10	مفهوم العولمة، مؤسسات المجتمع المدني
Week 11	الحكم الرشيد (المبادئ، المعايير) ، الاستفتاء
Week 12	الدستور وانواعه
Week 13	حقوق الطفل في المواثيق والعهود الدولية
Week 14	الجرائم الانسانية (جرائم الابادة الجماعية) وتأثيرها على حقوق الانسان والطفل والانظمة الديمقراطية
Week 15	الديمقراطية المعاصرة وحقوق الانسان والطفل, حالات لأمثلة واقعية حدثت في المجتمعات الدولية والعربية وفي العراق.
Week 16	امتحان نهاية الفصل

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	كتاب حقوق الانسان والديمقراطية. من تأليف :1-ا.د. ماهر صالح علاوي الجبوري، ا.د رياض عزيز هادي ، ا.د. رعد ناجي الجدة، ا.م.د كامل عبد العنكود ، ا.م.د علي عبد الرزاق محمد، ا.د. حسان محمد شفيق، (2009)	Yes
Recommended Texts	1- –الديمقراطية ،من تأليف : تشارلز تيللي ، ترجمة محمد فاضل طباخ ، الهيئة المصرية العامة للكتاب،(2010). 2- كتاب حقوق الانسان الاساسية والدور الامني لحمايتها، المؤلف: الدكتور مبارك علوي محمد،(2019).	No
Websites	N/A

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information معلومات المادة الدراسية				
Module Title	STRENGTH OF MATERIALS		**Module Delivery**	
Module Type	BASIC		**Theory** **Tutorial**	
Module Code	ENVR-ENG-102			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	1	**Semester (s) offered**		2
Min number of students	15	**Max number of students**		100
Administering Department	Mechanical Engineering	**College**	Engineering	
Module Leader	Sabah Mahdi Salih	**e-mail**	sabahmahdi@tu.edu.iq	
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**		MSc
Module Tutor	None	**e-mail**	None	
Peer Reviewer Name	Dr. Hazim Khalil Khalaf	**e-mail**	hazimKhalil@tu.edu.iq	
Review Committee Approval	01/06/2023	**Version Number**	1.0	

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Engineering Mechanics	**Semester**	1
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	1) To understand and be able to apply the principles of Strength of materales 2) To effectively communicate classical mechanics concepts and solutions to problems, both in written English and through mathematics. 3) To be able to apply critical thinking and problem solving skills in the application of classical mechanics

Module Learning Outcomes
 	
مخرجات التعلم للمادة الدراسية
	At the end of this course, you (the student) will be able to:
	   1) Apply basic physical principles of strength of Materials
	   2) Actin and Reactions to solve problems in beams loading.
	   3) The physical principles introduced in this course are those of Classical Mechanics and include:
	- The basic mathematical description of Simple Stress, Strain, loading types and beams types.
	- The basic mathematical description of the Thin walled cylinders and vessels.
	- The basic mathematical description of torsion in beams.
	- The basic mathematical description of Stresses in beams and beams deflection,

Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Introduction to Strength of Materials (2 hrs) • Action and Reactions (2 hrs) • Simple Stress (8 hrs) • Simple strain (8 hrs) • Thin walled cylinders (10 hrs) • Torsion in Beams (10 hrs) • Stresses in Beams (10 hrs) • Beams deflection (10 hrs)
Course Description	This course is designed to give engineering students a thorough understanding of the basic principles in Strength of materials. Classic mechanics will be introduced, including stresses, strain, torsion beams effected by loading etc. and you are expected to learn to solve elementary problems by applying Mathematics. Most students will find this a very demanding course that requires a significant amount of work and study time. For some, this will be the most challenging course you will encounter at the college level. For some disciplines, such as civil, chemical, mechanical, and electrical engineering, physics is directly applicable and serves as the introductory course to the more advanced applied physics or engineering classes. For all disciplines for which the 2200 series is required, the problem-solving and quantitative analysis skills you will learn from this course are a critical piece of your broader education.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	The learning and teaching **strategy** is designed to: Carefully cover in

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 45 **Tutorial** 30 **In class tests** 3	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 32 **Preparation for tests** 30 **Homeworks** 15	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	15% (15)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments	5	15% (15)	2, 4, 6, 8, 10	LO # 1, 2, 3, 4, 5 and 6
	Discussions	6	10% (10)	Continuous	
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Strength of Materials (introduction, what is Strength of materials, Action and reaction)
Week 2	Simple Stress
Week 3	Simple Stress
Week 4	Simple Strain
Week 5	Simple Strain

Week 6	Thin Walled cylinders
Week 7	**Midterm exam**, Thin Walled cylinders
Week 8	Thin Walled cylinders
Week 9	Torsion in Beams
Week 10	Torsion in Beams
Week 11	Torsion in Beams, Stresses in beams
Week 12	Stresses in beams
Week 13	Stresses in beams,
Week 14	Beams deflection
Week 15	Beams deflection
Week 16	**Final Exam**

<table>
<tr><td colspan="3" align="center">Learning and Teaching Resources
مصادر التعلم والتدريس</td></tr>
<tr><td></td><td align="center">Text</td><td align="center">Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>Strength of Materials By Ferdinand L. Singer, Andrew Pytel 1982</td><td>Yes</td></tr>
<tr><td>Websites</td><td>N/A</td><td></td></tr>
</table>

APPENDIX:

<table>
<tr><td colspan="5" align="center">GRADING SCHEME
مخطط الدرجات</td></tr>
<tr><td>Group</td><td>Grade</td><td>التقدير</td><td>Marks (%)</td><td>Definition</td></tr>
<tr><td rowspan="5">Success Group (50 - 100)</td><td>A - Excellent</td><td>امتياز</td><td>90 - 100</td><td>Outstanding Performance</td></tr>
<tr><td>B - Very Good</td><td>جيد جدا</td><td>80 - 89</td><td>Above average with some errors</td></tr>
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<tr><td rowspan="2">Fail Group (0 – 49)</td><td>FX – Fail</td><td>مقبول بقرار</td><td>(45-49)</td><td>More work required but credit awarded</td></tr>
<tr><td>F – Fail</td><td>راسب</td><td>(0-44)</td><td>Considerable amount of work required</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
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</table>

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		

Module Title	Air Quality Engineering	Module Delivery	
Module Type	Core		
Module Code	**ENVR-ENG-209**	**Theory** **Tutorial**	
ECTS Credits	4		
SWL (hr/sem)	100		

Module Level		2	Semester (s) offered		2
Min number of students		15	Max number of students		100
Administering Department	Environmental Engineering		College	Engineering	
Module Leader	Mohamed Bayati		e-mail	mohamed.burhan@tu.edu.iq	
Module Leader's Acad. Title	Lecturer		Module Leader's Qualification	PhD	
Module Tutor	None		e-mail	None	

Peer Reviewer Name	Assist. Prof. Dr. Salwa H. Ahmed	e-mail	dr.salwahadi@tu.edu.iq
Review Committee Approval	01/06/2023	Version Number	1.0

Relation With Other Modules

العلاقة مع المواد الدراسية الأخرى

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

Module Aims, Learning Outcomes, Indicative Contents and Brief Description

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	After studying this course, students will be able to: 1. Introduce students to the fundamentals of air pollution, including pollutant types, sources, and their environmental and health impacts. 2. Develop an understanding of meteorological influences on air pollution dispersion and the application of air quality monitoring techniques. 3. Equip students with the ability to evaluate air pollution control technologies and regulatory standards. 4. Encourage the exploration of sustainable urban air quality solutions, including green infrastructure, smart city initiatives, and clean transportation. 5. Work effectively in teams and develop problem-solving skills.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand and classify air pollutants, their sources, and their effects on human health and the environment; 2. Analyze meteorological factors and apply dispersion models to predict air pollution transport. 3. Analyze air quality monitoring techniques, interpret data using international air quality indices and standards, and evaluate suitable air pollution control technologies and mitigation strategies for various pollution sources. 4. Assess and develop sustainable urban air quality solutions, integrating green infrastructure, smart city initiatives, and clean transportation.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Air Pollution Sources & Effects (3 hr) • Meteorological Factors & Dispersion Models (9 hr) • Air Quality Monitoring & Standards (6 hr)

	• Air Pollution Control Technologies (6 hr) • Sustainable Urban Air Quality Solutions (6)
Course Description	This course provides an in-depth understanding of air pollution science, monitoring, and control technologies. It covers the sources, dispersion, and impacts of air pollution, alongside strategies for measurement, regulation, and mitigation. Students will explore dispersion modeling, air quality indices, policy frameworks, and sustainable urban solutions. Case studies will be used to illustrate real-world air quality challenges and interventions.

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

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

Student Workload (SWL)

الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures 45 In class tests 3	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 17 Preparation for tests 15 Homework 20	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

<table>
<tr><td colspan="5" align="center">Module Evaluation

تقييم المادة الدراسية</td></tr>
<tr><td></td><td>Time/ Number</td><td>Weight (Marks)</td><td>Week Due</td><td>Relevant Learning Outcome</td></tr>
</table>

		Time/ Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	16% (16)	6, 14	All
	Online Assignments	2	14% (14)	All	LO # 1, 2, 3,
	Project	1	5% (5)	11	All
	Seminar	1	5% (5)	13	All
Summative assessment	**Midterm Exam**	2 hr	10% (10)	7	LO # 1, 2
	Final Exam	3 hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	**Introduction to Air Pollution** - Definitions, and types of pollutants (primary/secondary, particulate/gaseous). - Health and environmental impacts.
Week 2	**Sources and Effects of Air Pollution** - Natural vs. anthropogenic sources (industrial, automotive, agricultural). - Global and local effects on ecosystems, materials, and climate.
Week 3	**Earth's Atmosphere & Climate Change** - Atmospheric composition and layers (troposphere, stratosphere). - Greenhouse effect, global warming causes/impacts, mitigation strategies. - Ozone Depletion & Acid Rain
Week 4	**Meteorological Factors Influencing Air Pollutant Dispersion** Atmospheric stability, Types of lapse rates, plume behavior.
Week 5	**Air Dispersion Model** - Introduction to Dispersion Models - Gaussian plume model: equations, dispersion coefficients.
Week 6	**Effective Stack Height** Buoyant plumes, non-buoyant plumes, and Plume rise for larger volume source
Week 7	**Midterm Exam**
Week 8	**Introduction to Air Quality Index (AQI)** - What is AQI and why it's important?

	- How AQI is calculated (based on pollutants like PM2.5, PM10, NO_2, SO_2, O_3, CO)
Week 9	**AQI Monitoring, Measurement, and Standards.** - Air Quality Monitoring Techniques - Air Quality Measurement Methods
Week 10	**AQI Monitoring, Measurement, and Standards.** - AQI Standards Across Different Countries - Using AQI Data for Public Health Warnings and Policies
Week 11	**Control Measures** - Control Measures for Air Pollution - Air pollution control technologies
Week 12	**Case Studies** Case studies of air pollution incidents and their management
Week 13	**Air Quality and Sustainable Urban Development** Impact of urbanization on air pollution Role of green infrastructure (urban forests, vertical gardens)
Week 14	**Air Quality and Sustainable Urban Development** Sustainable transport solutions (electric vehicles, bike-friendly cities, public transit) Smart city initiatives for air quality management
Week 15	**Review Session** Recap of key concepts, problem-solving workshops, Q&A.
Week 16	**Final Exam**

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Air Pollution by M.N. Rao and H.V.N. Rao. 1989 Publisher Tata McGraw-Hill ISBN: 9780074518717	Yes
Recommended Texts		
Websites		

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	COMPUTER II	**Module Delivery**
Module Type	SUPLEMENT	Theory Lab.
Module Code	UOT-031	
ECTS Credits	4	
SWL (hr/sem)	100	

Module Level	2	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Mohammed J. Abed	**e-mail**	Eng.mja@tu.edu.iq
Module Leader's Acad. Title	Assistant lecturer	**Module Leader's Qualification**	MSc
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. Waleed M. Sh. Alabdraba	**e-mail**	walabdraba@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

<table>
<tr>
<td colspan="4" align="center">**Relation With Other Modules**
العلاقة مع المواد الدراسية الأخرى</td>
</tr>
<tr>
<td>**Prerequisite module**</td>
<td>Computer Science</td>
<td>**Semester**</td>
<td>1,1</td>
</tr>
<tr>
<td>**Co-requisites module**</td>
<td>None</td>
<td>**Semester**</td>
<td>-</td>
</tr>
<tr>
<td colspan="4" align="center">**Module Aims, Learning Outcomes, Indicative Contents and Brief Description**
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر</td>
</tr>
<tr>
<td>**Module Aims**
أهداف المادة الدراسية</td>
<td colspan="3">This course introduces fundamental computing principles and programming concepts. Students use the high-level programming language, MATLAB to develop and implement programs to solve. engineering problems. Basic programming concepts covered include algorithm design, data types, flow control, functions, sorting, plotting, simulation, and numerical methods.</td>
</tr>
<tr>
<td>**Module Learning Outcomes**

مخرجات التعلم للمادة الدراسية</td>
<td colspan="3">By the end of this course, students will be able to:
• Introduce vectors and matrices in MATLAB,
• Apply basic concepts of Linear Algebra for vector and matrix operations,
• Perform 2D and 3D plotting,
• Formulate and solve systems of linear equations by Gaussian elimination and matrix inversion,
• Write conditional statements and loops,
• Write Scripts and functions in MATLAB,
• Solve some engineering problems using MATLAB,
• Apply the fundamental knowledge of mathematics, science & engineering, to solve real engineering problems (through case studies).</td>
</tr>
<tr>
<td>**Indicative Contents**
المحتويات الإرشادية</td>
<td colspan="3">Indicative content includes the following.
   • Force Vectors   (8 hrs)
   • Force System Resultants (8 hrs)
   • Equilibrium of a Rigid Body (8 hrs)
   • Friction   (8 hrs)
   • Center of Gravity and Centroid (6 hrs)
   • Moments of Inertia and virtual work   (8 hrs)
   • Structure (trusses and Frames)   (10 hrs)</td>
</tr>
<tr>
<td>**Course Description**</td>
<td colspan="3">The course covers the following topics:
MATLAB environment and important commands.
• Linear Algebra and matrix operations
• Fundamental engineering computing and statistics
• Save, load, display and fprint and other similar commands
• Communication with Excel
• 2D (normal, logarithmic and subplots) and 3D plotting
• Solutions to systems of linear equations
• Conditional statements (if statements, also any, all, find and other commands)
• Loops (for and while loops)
• MATLAB scripts and functions
• Polynomials, including numerical and symbolic differentiation and integration (trapz, quadl, integral, int, diff and other commands)</td>
</tr>
</table>

	• Using MATLAB for simple and complicated engineering problems (applying Matlab to solve problems related to mechanical engineering problems; thermal/fluid and solid mechanics)

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 30 **In lab lecture** 30 **Final Test** 3	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 17 **Prepartion for tests** 10 **Homeworks** 10	37	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	10% (10)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments (Homeworks)	5	10% (10)	2, 4, 6, 8, 10	LO # 1, 2, 3, 4, 5 and 6
	In Lab Application	15	20% (8)	Continuous	
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
week1	Introduction to programming in MATLAB, Principles of MATLAB
Week 2	MATLAB environment and commands
Week 3	Linear Algebra and matrices
Week 4	Fundamental engineering computing
Week 5	Save, load, display and print commands
Week 6	Communication with Excel
Week 7	**Midterm exam**
Week 8	2D and 3D plotting
Week 9	Solutions to systems of linear equations
Week 10	Conditional statements
Week 11	Loops
Week 12	MATLAB scripts and functions
Week 13	Polynomials, including differentiation and integration
Week 14	Using MATLAB for simple engineering problems
Week 15	Control flow and operators
Week 16	**Final Exam**

Computer Applications (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	Application on Principles of MATLAB
Week 2	Application on MATLAB environment and commands
Week 3	Application on Linear Algebra and matrices
Week 4	Application on Fundamental engineering computing
Week 5	Application on Save, load, display and print commands
Week 6	Application on Excel
Week 7	Application on 2D plotting
Week 8	Application on 3D plotting
Week 9	Application on linear equations

Week 10	Application on Conditional statements
Week 11	Application on Loops
Week 12	Application on MATLAB scripts and functions
Week 13	Application on Polynomials, differentiation and integration
Week 14	Application on using MATLAB for simple engineering problems
Week 15	Application on Control flow and operators

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**INTRODUCTION TO MATLAB FOR ENGINEERING STUDENTS,** David Houcque Northwestern University, (version 1.2, August 2005)	Yes
Recommended Texts		
Websites	N/A	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

<table>
<tr><td colspan="4" align="center">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td>ENGINEERING ANALYSIS</td><td colspan="2">Module Delivery</td></tr>
<tr><td>Module Type</td><td>BASIC</td><td rowspan="4" colspan="2" align="center">Theory
Tutorial</td></tr>
<tr><td>Module Code</td><td>MATH-201</td></tr>
<tr><td>ECTS Credits</td><td>6</td></tr>
<tr><td>SWL (hr/sem)</td><td>150</td></tr>
<tr><td>Module Level</td><td>2</td><td>Semester (s) offered</td><td>1</td></tr>
<tr><td>Min number of students</td><td>15</td><td>Max number of students</td><td>100</td></tr>
<tr><td>Administering Department</td><td>Environmental Engineering</td><td>College</td><td>Engineering</td></tr>
<tr><td>Module Leader</td><td>Tahseen Taha Othman</td><td>e-mail</td><td>tahseentaha@tu.edu.iq</td></tr>
<tr><td>Module Leader's Acad. Title</td><td>Assistant Prof.</td><td>Module Leader's Qualification</td><td>Ph.D.</td></tr>
<tr><td>Module Tutor</td><td>Mohamed Burhan Ali</td><td>e-mail</td><td>mohamedburhan@tu.edu.iq</td></tr>
<tr><td>Peer Reviewer Name</td><td>Prof. Dr. Raad H. Irzooqi</td><td>e-mail</td><td>Dr.raadhoobi@tu.edu.iq</td></tr>
<tr><td>Review Committee Approval</td><td>01/06/2023</td><td>Version Number</td><td>1.0</td></tr>
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Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	MATH-102	**Semester**	1,2
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	1- Develop an understanding of different mathematical methods used to model engineering applications 2- Ability to implement and solve mathematical models for engineering problems
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of this course students will be able to: 1- Identify, formulate, and solve engineering problems. 2- Use mathematical and analytical tools to solve engineering problems. 3- Communicate effectively about engineering problems. 4- Work effectively in teams on engineering projects. 5- Apply engineering principles to real-world problems.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • First Order Ordinary Differential Equations (10hrs) • Second Ordinary Differential Equations (10hrs) • Simultaneous Linear Differential Equations (10hrs) • Laplace Transform: (15hrs) • Fourier Series (15hrs) • Partial Differential Equations (15hrs)
Course Description	Mathematical analysis with emphasis on solution techniques and engineering applications. Topics include ordinary differential equations (ODEs), Laplace transformations, initial and boundary value problems, Fourier series and partial differential equations.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1- Engage students in active learning activities such as group discussions, case studies, and problem-solving exercises. Encourage them to actively participate in class by asking questions, sharing their ideas, and collaborating with their peers. 2- Emphasize conceptual understanding before delving into mathematical derivations. Help students grasp the underlying principles and theories, and then demonstrate how these concepts can be applied mathematically to solve engineering problems. 3- Use a variety of assessment methods to evaluate students' understanding and progress. Incorporate quizzes, assignments, projects, and exams that test their analytical skills, problem-solving abilities, and critical thinking.

Student Workload (SWL) الحمل الدراسي للطالب				
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **75** **In class tests** **3**	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing 25** **Preparation for tests** **27** **HomeWorks** **20**	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation تقييم المادة الدراسية					
		Time (hr)	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	All	LO #1, 2, 3
	Assignments	6	30% (30)	All	LO # 1, 2, 3, 4, and 5
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	First Order Ordinary Differential Equations: Separable Equations
Week 2	First Order Ordinary Differential Equations: Linear Equations; Exact Equations
Week 3	Second Ordinary Differential Equations: Homogeneous; Non- Homogeneous
Week 4	Second Ordinary Differential Equations: The Euler Cauchy Differential Equations; Power Series Solutions
Week 5	Simultaneous Linear Differential Equations
Week 6	Simultaneous Linear Differential Equations
Week 7	Special Functions: Gamma Function, **Midterm Exam**
Week 8	Special Functions: Euler Beta Function
Week 9	Laplace Transform:

	The General Method, The Transform of Special Functions
Week 10	Laplace Transform: The Shifting Theorems, The Differentiation and Integration of Transforms, Solving Differential Equations by Laplace Transform
Week 11	Fourier Series: The Euler Formulas, Half Range Expansion
Week 12	Fourier Transform: Properties of Fourier Transform, Solving Differential Equations by Fourier Transform
Week 13	Orthogonality Properties of Sine and Cosine
Week 14	Partial Differential Equations, Separation of Variables (Heat Equations)
Week 15	Partial Differential Equations, Separation of Variables (Wave Equations)
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Advanced Engineering Analysis C. Ray Wylie.	Yes
Recommended Texts	Advanced Engineering Mathematics, 5th ed., D.G. Zill and M.R. Cullen.	Yes
Websites		

APPENDIX:

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MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	ENGINEERING SURVEY	**Module Delivery**	
Module Type	SUPLEMENT	Theory Practical	
Module Code	ENVR-ENG-203		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	**Semester (s) offered**	2
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Mohammed Hashim Ameen	**e-mail**	Mohammed.Hashim @tu.edu.iq
Module Leader's Acad. Title	Lecture	**Module Leader's Qualification**	M.Sc.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Nadia N. Sabeh	**e-mail**	eng.nadianazhat@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

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العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td>-</td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td>-</td></tr>
<tr><td colspan="4" align="center">Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر</td></tr>
<tr>
<td>Module Aims
أهداف المادة الدراسية</td>
<td colspan="3">
The main objectives to be achieved after the completion of this course are summarized below:

1. To introduce students to the principles, techniques, and equipment used in surveying for engineering projects.
2. To provide students with an understanding of the basic concepts of geodesy, coordinate systems, and map projections.
3. To develop students' skills in measuring distances, angles, and elevations using various surveying equipment and techniques.
4. To teach students how to interpret survey data, and prepare plans, maps, and cross-sections for engineering projects.
5. To provide students with knowledge of surveying safety practices and protocols.
6. To help students understand how to apply surveying principles and techniques in the design, construction, and maintenance of engineering projects.
7. To develop students' skills in communication, teamwork, and problem-solving, which are critical for successful engineering surveying.
8. To introduce students to the latest technological advancements in surveying, such as GPS, GIS, and remote sensing, and how these technologies can be used in engineering projects.
</td>
</tr>
<tr>
<td>Module Learning Outcomes

مخرجات التعلم للمادة الدراسية</td>
<td colspan="3">

1. Understanding the fundamental principles and concepts of surveying techniques and their applications in engineering projects.
2. Knowledge of various types of surveying instruments and equipment, including their accuracy, limitations, and proper use.
3. Ability to collect, process, and analyze surveying data using appropriate mathematical and statistical techniques.
4. Ability to perform fieldwork, including planning and organizing surveying projects, measuring and recording data, and setting up control points.
5. Knowledge of safety practices and procedures in surveying, including the use of personal protective equipment and safety guidelines for working in hazardous conditions.
6. Understanding the impact of surveying on the environment and the importance of sustainability in surveying practices.
7. Ability to communicate effectively with stakeholders, including clients, contractors, and other members of the engineering team, about surveying results and their implications for the project.
</td>
</tr>
</table>

	8. Understanding the legal and ethical responsibilities of surveyors and their role in ensuring compliance with relevant laws and regulations. 9. Ability to use computer software and technology for data processing, mapping, and presentation. 10. Knowledge of the professional standards and codes of conduct that govern surveying practice and their role in maintaining high-quality standards in engineering surveying.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • **Basic concepts of surveying** (2 hrs) • **Distance measurement** (6 hrs) • **Earthworks** (4hrs) • **Vertical control** (6 hrs) • **Angle measurement** (6 hrs) • **Curves: Circular** (2 hrs) • **Underground surveying** (4 hrs)
Course Description	The course covers the following topics; Basic concepts of surveying, Distance measurement, Earthworks, Vertical control, Angle measurement, Curves, Underground surveying.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	This course is to introduce environmental engineering students with the basic knowledge of land measurement and surveying techniques. The overall course is designed to make the students able to learn and understand the theory and field procedure by applying suitable surveying methods to produce map.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures theoretical** 30 **Practical** 45 **In class tests** 3	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 30 **Preparation for tests** 20 **Homeworks** 10 **writing reports** 12	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	15% (15)	3-14	LO #1-3, 6, and 8
	Assignments	4	10% (10)	2-14	LO # 1-10
	Report	6	15%(15)	2-14	LO # 3, 4, 9 and 10
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Definition – Principles – Basic measurements – Control networks – Locating position – Plotting detail
Week 2	Tapes – Field work – Distance adjustment – Errors in taping – Accuracies – Electromagnetic distance measurement (EDM)
Week 3	Measuring principles – Meteorological corrections – Geometrical reductions – Errors, checking and calibration
Week 4	Other error sources – Instrument specifications – Developments in EDM
Week 5	Areas – Partition of land – Cross-sections
Week 6	Dip and strike – Volumes – Mass-haul diagrams – Introduction – Levelling
Week 7	– Definitions – Curvature and refraction – Equipment, **Midterm Exam**
Week 8	Instrument adjustment – Principle of levelling – Sources of error – Closure tolerances – Error distribution
Week 9	Levelling applications – Reciprocal levelling – Precise levelling – Digital levelling – Trigonometrical levelling
Week 10	The theodolite – Instrumental errors
Week 11	Instrument adjustment – Field procedure
Week 12	Measuring angles – Sources of error
Week 13	curves – Setting out curves – Compound and reverse curves
Week 14	Optical methods – Mechanical methods
Week 14	Line and level
Week 16	**Final Exam**

<table>
<tr><th colspan="2">Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي العملي</th></tr>
<tr><td></td><td>**Material Covered**</td></tr>
<tr><td>**1**</td><td>Identification Surveying Equipment + Distance Measurement By Tape + Horizontal Angle Measurement By Tape</td></tr>
<tr><td>**2**</td><td>Setting and Stakeout a columns by Rule 2,3,4</td></tr>
<tr><td>**3**</td><td>Stakeout a map on the ground using a tape measure</td></tr>
<tr><td>**4**</td><td>Identification Leveling and Using Equipment</td></tr>
<tr><td>**5**</td><td>Two Page Test</td></tr>
<tr><td>**6**</td><td>Reciprocal Leveling</td></tr>
<tr><td>**7**</td><td>Leveling Profile</td></tr>
<tr><td>**8**</td><td>Leveling Cross Section</td></tr>
<tr><td>**9**</td><td>Identification Theodolite and Using Equipment</td></tr>
<tr><td>**10**</td><td>Horizontal Distance Measurement</td></tr>
<tr><td>**11**</td><td>Vertical Distance Measurement</td></tr>
<tr><td>**12**</td><td>Stakeout parallel and perpendicular straight lines by tape and theodolite equipment.</td></tr>
<tr><td>**13**</td><td>Surveying a building with tape and theodolite</td></tr>
<tr><td>**14**</td><td>Stakeout a building with tape and theodolite</td></tr>
<tr><td>**15**</td><td>Stakeout a Circular curve by tape</td></tr>
</table>

<table>
<tr><th colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</th></tr>
<tr><td></td><td>**Text**</td><td>**Available in the Library?**</td></tr>
<tr><td>**Required Texts**</td><td>N.N. BASAK. Surveying and leveling, ISBN: 9780074603994, 9780074603994</td><td>NO</td></tr>
<tr><td>**Recommended Texts**</td><td>SURVEYING VOL. I&2 BY DR. B. C. PUNMIA , ER. ASHOK KR. JAIN , DR.ARUN KUMAR JAIN ISBN-13 : 978-8170088837 , ISBN-13: 9788189401238</td><td>No</td></tr>
<tr><td>**Websites**</td><td>N/A</td><td></td></tr>
</table>

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:	

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

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	ENVIRONMENTAL GEOLOGY	**Module Delivery**
Module Type	CORE	
Module Code	ENVR-ENG-205	**Theory** **Tutorial** **Discussion**
ECTS Credits	4	
SWL (hr/sem)	100	

Module Level	2	**Semester (s) offered**	2
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Dr. Haneen A. Kh. Karaghool	**e-mail**	Haneen82@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	-
Peer Reviewer Name	Dr. Salwa H. Ahmed	**e-mail**	dr.salwahadi@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

<table>
<tr><td colspan="4" align="center">**Relation with Other Modules**
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>**Prerequisite module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
<tr><td>**Co-requisites module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
</table>

<table>
<tr><td colspan="2" align="center">**Module Aims, Learning Outcomes, Indicative Contents and Brief Description**
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر</td></tr>
<tr><td>**Module Aims**
أهداف المادة الدراسية</td><td>Environmental geology imparts geological information to understand the interactions between Earth's living organisms, particularly humans, and its geological components (rocks, minerals, soils, rivers, energy resources, morphology, geological structures, processes, and phenomena). It explains how geological resources play a role in environmental planning, spatial organization, and regional development that alters our resources. The effects of geological processes on human existence are also discussed, including geological dangers and disasters.</td></tr>
<tr><td>**Module Learning Outcomes**

مخرجات التعلم للمادة الدراسية</td><td>1. Recognize the fundamental geological concepts that influence environmental challenges.
2. Explain the principles, processes, and products of rock-water interactions in the near-surface environment.
3. Describe the geologic elements that impact how surface and groundwater resources are used, supplied, and contaminated.
4. Recognize the geological features of waste disposal and management Assess and debate problems related to various environmental case studies.
5. Be educated about the connections between people and the environment, especially how population growth affects natural processes like soil erosion and desertification.
6. Describe and define Earth systems concepts related to climate change, such as greenhouse gases and arid landscapes.</td></tr>
<tr><td>**Indicative Contents**
المحتويات الإرشادية</td><td>Indicative content includes the following:
• Environmental Geological Principles and Concepts (12 hrs.)
• Environmental Geological Issues in Waste Management (12hrs.)
• Natural Geological Hazards (18 hrs.)
• The Human-Earth System Relationship (3hrs.)</td></tr>
<tr><td>**Course Description**</td><td>Environmental geology is the study of how people interact with their natural surroundings, including rocks, water, air, soil, and life. Both the processes of Earth and human activity have an effect on the planet. The study of these environmental interactions will be based on physical geologic principles (rocks, minerals, and plate tectonics) in this introductory-level course. Natural hazards like earthquakes, volcanoes, and storms; natural resources like water, soil, and energy; climate change; and human population will all be covered in this course.</td></tr>
<tr><td colspan="2" align="center">**Learning and Teaching Strategies**
استراتيجيات التعلم والتعليم</td></tr>
<tr><td>**Strategies**</td><td>The learning and teaching **strategy** is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques and demonstrate concepts with appropriate (and where possible practical)</td></tr>
</table>

	examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
In class lectures **42** Discussion **3** In class tests **3**	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Library, dorm, home memorizing **22** Preparation for tests **15** Homework **15**	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time (hr.)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	16% (16)	3, 7, 10, 14	All
	Assignments	15	16% (16)	All	LO # 1, 2, 3, and 4
	Discussion	3	8%(8)	Continuous	
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-4
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Fundamental Concepts of Environmental Geology
Week 2	Earth Structure and Plate Tectonics, Plate Tectonics and the Environment
Week 3	Minerals , Rocks and the Environment
Week 4	Natural hazards. Streams and flooding
Week 5	Natural hazards. Landslides and subsidence
Week 6	Natural hazards. Earthquakes and volcanic activity
Week 7	**Mid-Term Exam**

Week 8	Water resources
Week 9	Water pollution
Week 10	Soil resources and the environment
Week 11	Desertification. Deserts and draught
Week 12	Energy resources
Week 13	Pollution and waste disposal
Week 14	Mining and the environment
Week 15	Waste management and geology , Environmental analysis
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**ACCESS Environmental Geology: An Earth Systems Approach by Dorothy Merritts, Kirsten Menking, Andrew DeWet, 2018. 2nd Edition. Environmental Geology by James S. Reichard , 2011, publishedby McGraw-Hill.**	No
Recommended Texts	**"Environmental Geology: Geology And The Human Environment" by Bennett M R, 2016. "Environmental Geology: Ecology, Resource and Hazard Management" by K S Valdiya, 2002. Introduction to Environmental Geology by Edward A. Keller, 2012, 5th ed.**	No

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
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Note:

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MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information	
معلومات المادة الدراسية	

Module Title	ENVIRONMENTAL MICROBIOLOGY	**Module Delivery**	
Module Type	CORE	Theory Practical	
Module Code	ENVR-ENG-208		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Mohammed M. Numaan	**e-mail**	Mohammed.m.numaan@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Salwa Hadi Ahmed	**e-mail**	dr.salwahadi@tu.edu.iq
Review Committee Approval	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, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1. To understand the role of important microbes in environmental processes and applications. 2. To utilize the principles of microbiology and biochemistry to understand, describe, and predict engineered and natural biological processes. 3. To develop knowledge and analytical skills related to environmental microbiology.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of this course, students will be able to: • Identify the main concepts of microbial ecology. • Learn a sound background in microbiology and environmental biology. • Improve understanding of selected ideas and mechanisms and achieve a broader perspective of the topic. • Enhancing students' abilities to pull important information out of the literature and to work in a group to organize and review a topic in depth.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Microorganisms and microbial groups (4hrs) • Chemistry and biochemistry (4hrs) • Cell structure and function (4hrs) • Microbial metabolism (4hrs) • Microbial growth (10hrs) • Microbial catabolism (4hrs) • Nutrient cycles and bioremediation (2hrs) • Biological applications of microorganisms (2hrs) • Industrial Microbiology (2hrs) • Molecular microbiology (8hrs) • Methods in Microbial ecology (2hrs)
Course Description	Fundamentals of microbiology, biochemistry, and aquatic biology as they apply to environmental engineering. General topics include cell structure and composition, microbial metabolism, bioenergetics, microbial ecology, bioremediation, and biodegradation.

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching **strategy** is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
In class lectures	**30**			
Lab	**45**			
In class tests	**3**			
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Library, dorm, home memorizing	**22**			
Preparation for tests	**10**			
Preparation for Reports	**20**			
Homeworks	**20**			
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل		150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	3	15% (15)	3, 5, 9, 11, 13	LO #1-3
	Assignments	8	10% (10)	2, 4, 6, 8, 10	LO # 1, 2, 3, and 4
	Lab Reports	15	15% (15)	All	LO # 3
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Microorganisms and Microbiology
Week 2	Microbial groups
Week 3	Chemistry and biochemistry
Week 4	Cell structure and function
Week 5	Microbial metabolism
Week 6	Microbial growth

Week 7	Microbial Evolution and systematics, **Midterm Exam**
Week 8	Bacteria: the proteobacteria, Gram-Positive and other bacteria
Week 9	Archaea/Eukaryotic cells
Week 10	Metabolic diversity
Week 11	Microbial catabolism
Week 12	Microbial ecosystems
Week 13	Nutrient cycles and bioremediation
Week 14	Molecular microbiology
Week 15	Methods in Microbial ecology
Week 16	**Final Exam**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Laboratory safety, Preparation of the medium
Week 2	Preparation of solid and liquid medium
Week 3	Preparation of membranes (slides), Lecture on how to use light microscope
Week 4	Total count of germs
Week 5	Detection of bacteria of the colon
Week 6	Way to measure the total count of bacteria colonies and the more likely way to use in measurement
Week 7	Detection of fecal causative bacteria

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Brock Biology of Microorganisms, M. T. Madigan, J. M. Martinko, and D. Clark. 2009. Prentice Hall, N.J., 12th Edition or above	Yes
Recommended Texts	Environmental Biology for Engineers and Scientists David A. Vaccari, Peter F. Strom, James E. Alleman, John Wiley & Sons, Inc, 2006	No
Websites		

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
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Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المـادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	FLUID FLOW	**Module Delivery**	
Module Type	CORE	Theory Practical Tutorial	
Module Code	ENVR-ENG-207		
ECTS Credits	6		
SWL (h/sem.)	150		
Module Level	2	**Semester (s) offered**	2
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Akram K. Mohammed	**e-mail**	akram.mohammed@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	M.Sc.
Module Tutor	Khalid A. Saleh	**e-mail**	khalid.ahmed@tu.edu.iq
Peer Reviewer Name	Dr. Raad H. Irzooki	**e-mail**	dr.raadhoobi@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

<table>
<tr><td colspan="4" align="center">Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>Prerequisite module</td><td>Fundamentals of Fluid Mechanics</td><td>Semester</td><td>1</td></tr>
<tr><td>Co-requisites module</td><td>None</td><td>Semester</td><td>-</td></tr>
<tr><td colspan="4" align="center">Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر</td></tr>
<tr><td colspan="2">Module Aims
أهداف المادة الدراسية</td><td colspan="2">This course is attempted to help satisfy the required need for bringing together the information related to the principle of fluid flow.</td></tr>
<tr><td colspan="2">Module Learning Outcomes

مخرجات التعلم للمادة الدراسية</td><td colspan="2">Interpret and analyses data related to fluid flow.
Apply the fundamental of fluid flow on each component of the ideal and real fluids.
Formulate the elementary principles of fluid flow including mass conservation law, momentum conservation law, Energy conservation law, Bernoulli's equation in both ideal and real fluid, friction losses in pipe flow, flow through branched pipes, Pumps and turbines.
Understand the basics of fluid flow.</td></tr>
<tr><td colspan="2">Indicative Contents
المحتويات الإرشادية</td><td colspan="2">Indicative content includes the following.
Definition of fluid flow through ducts (8 hrs.)
Classification of flow depending on Time, distance, Forces affected and Direction (8 hrs.)
Derivation of Mass Conservation Law, Momentum Conservation Law and Energy Conservation Law (28 hrs.)
Real and Ideal Fluid Flow and Friction Losses (32 hrs.)
Flow through Branched Pipes (14 hrs.)</td></tr>
<tr><td colspan="2">Course Description</td><td colspan="2">Fluid mechanics is the study of fluids either in motion (fluid dynamics) or at rest (fluid statics) and the subsequent effects of the fluid upon the boundaries, which may be either solid surfaces or interfaces with other fluids. Both gases and liquids are classified as fluids, and the number of fluids engineering applications is enormous: breathing, blood flow, swimming, pumps, fans, turbines, airplanes, ships, rivers, windmills, pipes, missiles, icebergs, engines, filters, jets, and sprinklers, to name a few. When you think about it, almost everything on this planet either is a fluid or moves within or near a fluid.</td></tr>
<tr><td colspan="4" align="center">Learning and Teaching Strategies
استراتيجيات التعلم والتعليم</td></tr>
<tr><td colspan="2">Strategies</td><td colspan="2">The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.</td></tr>
</table>

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem.) الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures 60 In Lab Lectures 30 Final Exam 3	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem.) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 20 Preparation for tests 15 Preparation for Reports 10 Home Works 12	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem.) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr.)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	15% (15)	2, 4, 7, 10,12,14	LO #1, 2, 3, and 4
	Assignments	10	10% (10)	3, 6, 9, 12	LO # 1, 2, 3, and 4
	Reports	10	15% (15)	All	LO # 3, 4
Summative assessment	Midterm Exam	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	General Introduction and Fluid Flow through Ducts.
Week 2	Classification of Flow Depending on Time, Distance, Forces affected and Direction.
Week 3	Basic Equations of Fluid Motion (Mass Conservation Law).
Week 4	Basic Equations of Fluid Motion (Momentum Conservation Law).
Week 5	Basic Equations of Fluid Motion (Energy Conservation Law).
Week 6	Applications of Bernoulli's Equation.

Week 7	**Midterm Exam.**
Week 8	Energy Equation in Real Fluid Flow.
Week 9	Flow and Friction Losses in Pipes.
Week 10	Types of Pipe-Flow Problems Including Head Loss, Discharge and Sizing Problems.
Week 11	Flow through Branched Pipes Including Series and Parallel Pipe System.
Week 12	General Concept of Connected Multiple Tanks.
Week 13	Pumps and Turbines
Week 14	Introduction to Open Channels Flow (Geometry of Channel and Manning's Equation).
Week 15	Review Week before Final Exam.
Week 16	**Final Exam.**

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction in Fluid Mechanics Laboratory and Description of Laboratory Equipment.
Week 2	Calibration of Current Meter Experiment.
Week 3	Calibration of Current Meter Experiment (Contd.).
Week 4	Bernoulli's Equation Experiment.
Week 5	Bernoulli's Equation Experiment (Contd.).
Week 6	Impact of Jet Experiment.
Week 7	Impact of Jet Experiment (Contd.).
Week 8	Calibration of Venturimeter Experiment.
Week 9	Calibration of Venturimeter Experiment (Contd.).
Week 10	Reynolds Experiment.
Week 11	Reynolds Experiment (Contd.).
Week 12	Determination of Coefficient of Friction Experiment.
Week 13	Determination of Coefficient of Friction Experiment (Contd.).
Week 14	Review Week before Final Exam.
Week 15	**Final Exam.**

<table>
<tr><th colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</th></tr>
<tr><td></td><td>Text</td><td>Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>Elementary Fluid Mechanics by John K. Vennard and Robert L. Street, John Wiley & Sons 1982.</td><td>No</td></tr>
<tr><td>Recommended Texts</td><td>1. Fluid Mechanics by Frank M. White, McGraw – Hill, Fourth Edition.
2. Experiments in Fluid Mechanics (2009), by Sarbjit Singh.</td><td>Yes</td></tr>
<tr><td>Websites</td><td colspan="2">https://open.umn.edu/opentextbooks/textbooks?term=fluid+mechanics&commit=Go</td></tr>
</table>

APPENDIX:

	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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	Fundamentals of fluid mechanics	**Module Delivery**
Module Type	Core	Theory Practical Tutorial
Module Code	ENVR-ENG-202	
ECTS Credits	6	
SWL (h/sem.)	150	

Module Level	2	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Akram K. Mohammed	**e-mail**	akram.mohammed@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	M.Sc.
Module Tutor	Khalid A. Saleh	**e-mail**	khalid.ahmed@tu.edu.iq
Peer Reviewer Name	Dr. Raad H. Irzooki	**e-mail**	dr.raadhoobi@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

<table>
<tr><th colspan="4" align="center">Relation With Other Modules
العلاقة مع المواد الدراسية الأخرى</th></tr>
<tr><td>Prerequisite module</td><td>None</td><td>Semester</td><td>-</td></tr>
<tr><td>Co-requisites module</td><td>Fluid Flow</td><td>Semester</td><td>2</td></tr>
<tr><td colspan="4" align="center">Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر</td></tr>
<tr><td>Module Aims
أهداف المادة الدراسية</td><td colspan="3">This course is attempted to help satisfy the required need for bringing together the information related to the principle of fluid mechanics and static fluids.</td></tr>
<tr><td>Module Learning Outcomes

مخرجات التعلم للمادة الدراسية</td><td colspan="3">1. Interpret and analyses data related to fluid mechanics.
2. Apply the fundamental of fluid mechanics on each component of the static fluids.
3. Formulate the elementary principles of fluid mechanics including properties of fluids, pressure measurement in static fluids, forces acting on the submerged surfaces and floating bodies.
4. Understand the basics of static fluids.</td></tr>
<tr><td>Indicative Contents
المحتويات الإرشادية</td><td colspan="3">Indicative content includes the following.
• Definition of fluid mechanics and Units (10 hrs.)
• Properties of fluid mechanics (10 hrs.)
• Fundamentals of static fluids (20 hrs.)
• Forces acting on submerged surfaces (10 hrs.)
• Submerged and floating bodies (10 hrs.)</td></tr>
<tr><td>Course Description</td><td colspan="3">Fluid mechanics is the study of fluids at rest (static fluids) and the subsequent effects of the fluid upon the boundaries, which may be either solid surfaces or interfaces with other fluids. Both gases and liquids are classified as fluids, and the number of fluids engineering applications is enormous: breathing, blood flow, swimming, pumps, fans, turbines, airplanes, ships, rivers, windmills, pipes, missiles, icebergs, engines, filters, jets, and sprinklers, to name a few. When you think about it, almost everything on this planet either is a fluid or moves within or near a fluid.</td></tr>
<tr><td colspan="4" align="center">Learning and Teaching Strategies
استراتيجيات التعلم والتعليم</td></tr>
<tr><td>Strategies</td><td colspan="3">The learning and teaching strategy is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.</td></tr>
</table>

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem.) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 60 **Lab** 30 **Final Exam** 3	93	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
Unstructured SWL (h/sem.) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 20 **Prepartion for reports** 10 **Preparation for tests** 15 **Home Works** 12	57	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
Total SWL (h/sem.) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr.)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	15% (15)	2, 4, 7, 10,12,14	LO #1, 2, 3, and 4
	Assignments	10	10% (20)	3, 6, 9, 12	LO # 1, 2, 3, and 4
	Lab. Reports	10	15% (15)	2-14	LO # 3, 4
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	General introduction.
Week 2	Review of fundamentals of fluid mechanics, units.
Week 3	Properties of fluids (Mass density, Weight density, Relative density, Specific volume, Viscosity, Compressibility and Surface tension).
Week 4	Properties of fluids (Mass density, Weight density, Relative density, Specific volume, Viscosity, Compressibility and Surface tension).
Week 5	Newton's equation of viscosity.
Week 6	Principle of static fluids and general equation related with variation of pressure.

Week 7	Pressure measurement in static fluids.
Week 8	**Midterm Exam**
Week 9	General concept of forces affecting on submerged bodies.
Week 10	Forces affecting on submerged plane surfaces.
Week 11	Forces affecting on submerged curved surfaces.
Week 12	General concept of submerged and floating bodies.
Week 13	Stability of floating and submerged bodies.
Week 14	Stability of floating and submerged bodies.
Week 15	Review Week before Final Exam.
Week 16	Final Exam.

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Introduction in Fluid Mechanics Laboratory.
Week 2	Description of Laboratory Equipment.
Week 3	Description of Laboratory Equipment (Contd.).
Week 4	Calibration of Rotometer.
Week 5	Calibration of Rotometer (Contd.).
Week 6	Determination of Viscosity by Capillary Tube Viscometer.
Week 7	Determination of Viscosity by Capillary Tube Viscometer (Contd.).
Week 8	Determination of Hydrostatic Forces.
Week 9	Determination of Hydrostatic Forces (Contd.).
Week 10	Determination of Metacentric Height.
Week 11	Determination of Metacentric Height (Contd.).
Week 12	Review Week before Final Exam.
Week 13	Review Week before Final Exam (Contd.).
Week 14	Review Week before Final Exam (Contd.).
Week 15	Review Week before Final Exam (Contd.).

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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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	**THERMODYNAMICS**	**Module Delivery**
Module Type	**SUPLEMENT**	Theory Tutorial
Module Code	**ENVR-ENG-201**	
ECTS Credits	4	
SWL (hr/sem)	100	
Module Level	2	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Maaly Nasrat Tawfiq	**e-mail**	Maaly.n.tawfeq@tu.edu.iq
Module Leader's Acad. Title	Assistant Lecture	**Module Leader's Qualification**	MSc
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Waleed M. Sh. Alabdraba	**e-mail**	walabdraba@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

<table>
<tr><td colspan="4" align="center">**Relation With Other Modules**
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>**Prerequisite module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
<tr><td>**Co-requisites module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
</table>

<table>
<tr><td colspan="2" align="center">**Module Aims, Learning Outcomes, Indicative Contents and Brief Description**
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر</td></tr>
<tr>
<td>**Module Aims**
أهداف المادة الدراسية</td>
<td>1) Enable the student to know theoretical and practical concepts of the thermodynamic processes.
2) Enable the student to know theoretical concepts of the physics materials properties and heat effect on it.
3) Enable the student to know the types of system and there applications and how to deal with it.
4) Enable the student to know the types of energy and practice applications.</td>
</tr>
<tr>
<td>**Module Learning Outcomes**

مخرجات التعلم للمادة الدراسية</td>
<td>1) Ability to understand the basic concepts of thermodynamic such as temperature, pressure, system, properties, process, state, cycles and equilibrium.
2) Ability to identify the properties of substances on property diagrams and obtain the data from property tables.
3) Ability to define energy transfer through mass, heat and work for closed and control volume systems.
4) Ability to apply the first Law of Thermodynamics on closed and control volume systems.
5) Understanding of the differences between ideal and real systems.
6) Use of thermodynamics tables. Use of correlation charts. Ability to apply correct theoretical or empirical model.</td>
</tr>
<tr>
<td>**Indicative Contents**
المحتويات الإرشادية</td>
<td>Indicative content includes the following.
• Some concepts and definitions and types of the systems (3 hrs)
• Measurement of pressure and temperature (3 hrs)
• Forms of Energy (3 hrs)
• Properties of Pure Substances (6 hrs)
• Perfect gas laws (6 hrs)
• Thermodynamics laws / First law of thermodynamic (6hrs)
• Applied to the closed system process(6hrs)
• Applied to the open system process(9hrs)</td>
</tr>
<tr>
<td>**Course Description**</td>
<td>The course has the advantage of developing the students ability to understand thermodynamic object, know the types of energy and practice applications, know the heat effect on environment and how can be calculate the heat lost and gain from or by the system.</td>
</tr>
<tr><td colspan="2" align="center">**Learning and Teaching Strategies**
استراتيجيات التعلم والتعليم</td></tr>
<tr>
<td>**Strategies**</td>
<td>The learning and teaching **strategy** is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical)</td>
</tr>
</table>

	examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 45 **In class tests** 3	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **dorm, home memorizing** 22 **Prepration for tests** 20 **Homeworks** 10	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.4
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	24% (24)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments (Homework's)	6	16% (16)	2, 4, 6, 7	LO # 1, 2, 3, 4, 5 and 6
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Some concepts and definitions and types of the systems
Week 2	Measurement of pressure and temperature
Week 3	Forms of Energy
Week 4	Properties of Pure Substances
Week 5	Steam table
Week 6	Perfect gas laws
Week 7	Solved examples and problems
Week 8	**Midterm exam**

Week 9	Thermodynamics laws / First law of thermodynamic
Week 10	Solved examples and problems
Week 11	Thermodynamic processes - Applied to the closed system process
Week 12	Solved examples and problems
Week 13	Thermodynamic processes - Applied to the open system process
Week 14	Thermodynamic processes - Applied to the open system process , cont'd
Week 15	Solved examples and problems
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Thermodynamics An Engineering Approach, Yunus A. Cengel and Michael A., 5th Edition Boles McGraw-Hill, 2006.**	Yes
Recommended Texts	**- Introduction to Thermodynamics and Heat Transfer , Yunus A. Cengel2nd ,edition, 2009.- Applied thermodynamic for engineering Basic teaching and learning resources and tools technologist, Estop, T. D. and MacConkey, A., Kindersley Fifth edition ,2009.**	No
Websites	N/A	

APPENDIX:

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
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	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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	WATER SUPPLY ENGINEERING	**Module Delivery**
Module Type	CORE	
Module Code	ENVR-ENG-206	Theory
ECTS Credits	6	Tutorial
SWL (hr/sem)	150	Laboratory
Module Level	2	**Semester (s) offered**	2
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Dr. Nadia Nazhat Sabeeh	**e-mail**	eng.nadianazhat@tu.edu.iq
Module Leader's Acad. Title	Assist. Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. Waleed M. Sh. Alabdraba	**e-mail**	walabdraba@tu.edu.iq
Review Committee Approval	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, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	Enable students to understand how to estimate the water consumption for various purposes and forecasting the population. The module also aims to define water sources and the most important pollutants that may be present in them, and to determine the water quality by comparing it with specifications. The design of water treatment is covered during the course.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Be able to understand the basic concepts of water consumption. 2- Learn how to forecast the population. 3- Learn how to design water treatment plant units. 4- Be able to know the important concepts of operations that take place in the water treatment plant units.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Per capita water consumption (9hrs) • Common impurities in water (11 hrs) • Conventional water treatment plant design (22 hrs) • Water softening (3 hrs)
Course Description	Water Supply Engineering is a topic that concern about the water resources and how to collect water and treat it in special units to supply then to consumers. Design the water treatment plant units is covered during the course.

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching strategy is designed to: Carefully cover in lectures and laboratory the necessary fundamental material and analytical techniques and demonstrate concepts and design criteria with appropriate examples allow students adequate time to practice the design of water treatment units.

Student Workload (SWL) الحمل الدراسي للطالب				
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 45 **Lab** 30 **Final test** 3	78	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا		5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 20 **Preparation for reports** 24 **Preparation for tests** 18 **Homeworks** 10	72	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا		4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150			

Module Evaluation تقييم المادة الدراسية					
		Time (hr)	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	4	12 % (12)	3, 6, 9, 13	LO #1, 2, 3, and 4
	Assignments • **Homeworks** • **Lab. Reports** • **Discussion**	4 15 3	8% (8) 15% (15) 5% (5)	4, 6, 10, 12 All All	LO # 1, 2, 3, and 4
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-2
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Per capita water consumption
Week 2	Fire demand
Week 3	Population forecasting
Week 4	Common impurities in water
Week 5	Water quality
Week 6	Water treatment philosophy

Week 7	Midterm exam
Week 8	Intakes and screens
Week 9	Intakes and screens, continued
Week 10	Plain sedimentation
Week 11	Plain sedimentation, continued
Week 12	Sedimentation with chemicals (Coagulation and Flocculation)
Week 13	Filtration
Week 14	Disinfection, Taste and Odor Control
Week 15	Water Softening
Week 16	Final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	Lab 1: Determination of temperature of water
Week 2	Lab 2: Determination of Total dissolved solids (TDS)
Week 3	Lab 3: Determination of Total suspended solids (TSS)
Week 4	Lab 4: Determination of Total solids (TS)
Week 5	Lab 5: Determination of Turbidity of water
Week 6	Lab 6: Determination of sulphate (SO_4) by turbidity method
Week 7	Lab 7: Determination of Chlorides
Week 8	Lab 8: Determination of Odor
Week 9	Lab 9: Determination of Color
Week 10	Lab 10: Determination of Dissolved Oxygen in water
Week 11	Lab 11: Determination of Chlorine Demand
Week 12	Lab 12: Determination of Optimum Dose of Coagulant
Week 13	Lab 13: Determination of Total Hardness
Week 14	Lab 14: Determination of Calcium Hardness
Week 15	Lab 15: Determination of Calcium and Magnesium concentration

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<tr><td>Recommended Texts</td><td>Water Supply and Sewerage. Fifth ed., by Terence J. Mc Ghee , 1979. Publisher McGraw- Hill, Inc.</td><td align="center">No</td></tr>
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	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	ENGINEERING HYDROLOGY	**Module Delivery**	
Module Type	CORE		
Module Code	ENVR-ENG-310	**Theory** **Tutorial**	
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	**Semester (s) offered**	2
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Dr. Wesam S. Mohammed-Ali	**e-mail**	wisam.s.mohammed@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	Ahmed S. Mahmood	**e-mail**	ahmed.s.mahmood@tu.edu.iq
Peer Reviewer Name	Dr. Raad H. Irzooki	**e-mail**	dr.raadhoobi@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

<table>
<tr><td colspan="4" align="center">**Relation With Other Modules**
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>**Prerequisite module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
<tr><td>**Co-requisites module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
<tr><td colspan="4" align="center">**Module Aims, Learning Outcomes, Indicative Contents and Brief Description**
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر</td></tr>
<tr><td colspan="2">**Module Aims**
أهداف المادة الدراسية</td><td colspan="2">This course attempted to help satisfy the required need for bringing together information related to the basics of hydrology and the water cycle and its importance through a relationship to water resources projects.</td></tr>
<tr><td colspan="2">**Module Learning Outcomes**

مخرجات التعلم للمادة الدراسية</td><td colspan="2">1. Understand the principles of hydrology: Students should develop a solid understanding of the fundamental concepts and principles of hydrology, including the water cycle, precipitation, evapotranspiration, infiltration, runoff, and streamflow.
2. Assess hydrological risks: Students should be able to assess hydrological risks associated with extreme events such as floods and droughts. They should understand the factors that contribute to these risks and be able to develop strategies for mitigating them.
3. Analyze hydrological data: Students should be able to collect, interpret, and analyze hydrological data, including rainfall data, streamflow data, and groundwater data. They should be familiar with statistical methods and techniques commonly used in hydrological analysis.
4. Apply hydrological theories: Students should be able to apply computational techniques to predict various hydrological processes such as water supply, flood control, and environmental sustainability.
5. Design and manage water resources systems: Students should be able to design and manage water resources systems, considering factors they should understand the principles of water resources planning and management and be able to apply them to real-world engineering problems.</td></tr>
<tr><td colspan="2">**Indicative Contents**
المحتويات الإرشادية</td><td colspan="2">The indicative contents of Engineering Hydrology cover the following topics:
• Introduction to Hydrology, water Cycle, and water balance (8 hrs.)
• Rainfall, Evapotranspiration, Infiltration Analysis (16 hrs.)
• Hydrological risk analysis. (8 hrs.)
• Runoff and Hydrographs (12 hrs.)
• Flood Hydrology (10 hrs.)
• Groundwater Hydrology (6 hrs.)</td></tr>
<tr><td colspan="2">**Course Description**</td><td colspan="2">This course aims to establish fundamental knowledge of Engineering Hydrology is a field of study that focuses on the application of hydrological principles and methods to engineering design and water resources management. This course provides students with a comprehensive understanding of the principles and practices of hydrology, emphasizing their practical applications in engineering projects. students should have a strong foundation in engineering hydrology, enabling them to assess and manage water resources, design engineering projects with hydrological considerations, and make informed decisions regarding water-related issues in various contexts.</td></tr>
</table>

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **60** **In class tests** **3**	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing 40** **Preparation for tests** **12** **HomeWorks** **10**	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20% (20)	2, 4, 7, 10,12,14	LO #1, 2, 3, and 4
	Assignments	10	20% (20)	3, 6, 9, 12	LO # 1, 2, 3, 4, and 5
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Engineering Hydrology, Hydrologic Cycle, Weather and Climate.
Week 2	Probability in Hydrology and Plotting Position Method
Week 3	Precipitation- Types of Precipitation- Measurement of Precipitation
Week 4	Flood Risk analysis
Week 5	Estimating Missing Precipitation Data, Double Mass Curve Analysis, Methods of Determination of Average Precipitation over area.
Week 6	Frequency of Rainfall, Hyetograph, and accumulated rainfall.

Week 7	Evaporation- Factors Controlling the Evaporation- Determination of Evaporation- Evaporation and Transpiration -ET Equations
Week 8	**Mid-Term Exam**
Week 9	Infiltration-Measurement of Infiltration- Infiltration capacity.- Infiltration Indices Φ-Index and W-Index
Week 10	Runoff- Runoff -Rainfall Relationship.
Week 11	Hydrograph Analysis ,Components of Hydrograph , Hydrograph Separation , Synthetic Hydrograph
Week 12	Unit Hydrograph, Conversion of Unit Hydrograph, S-curve
Week 13	Flood Routing- River Routing-Reservoir Routing- Gumbel Distribution
Week 14	Introduction to Groundwater hydrology
Week 15	**Review Week before Final Exam**
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	**Engineering Hydrology ,Second Edition Mc Graw hill ,New Delhi,K.Subramanya,1997.**	Yes
Recommended Texts	**Chow, V.T, Hand book of applied hydrology, Mc Graw hill, New York.** **Hydrology for Engineering (Linsley).**	Yes
Websites	[Handbook of Applied Hydrology](#)	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	FUNDAMENTALS OF WASTEWATER	**Module Delivery**
Module Type	CORE	Theory Tutorial Lab.
Module Code	ENVR-ENG-301	
ECTS Credits	6	
SWL (hr/sem)	150	

Module Level	3	Semester (s) offered	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Masood Muhsin Hazzaa	**e-mail**	masood.mohsen@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	MSc
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. waleed M.Sh. Alabdraba	**e-mail**	walabdraba@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Environmental Microbiology	**Semester**	1
Co-requisites module	Waste Water Treatment	**Semester**	2

Module Aims, Learning Outcomes, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1- Knowing the types and characteristics of wastewater and how to deal with it. 2- To explain the concept of wastewater treatment. 3- To give information about the wastewater treatment methods. 4- Explanation of preliminary treatment. 5- Explanation of primary treatment. 6- Determinations of reaction rates. 7- Explain the design criteria. 8- Studying some experimental lab.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Use each of the conceptual techniques for wastewater treatment. 2- Knowing the design procedure of wastewater treatment units. 3- Building and analyzing mathematical models. 4- Understanding the source of wastewater generation. 5- Understanding and using the general ideas for wastewater in correct scientific ways. 6- Determine the most common applications using wastewater treatment. 7- Understanding and using the most modern techniques in wastewater treatment. 8- Understanding and calculating methods of working with modern mechanical techniques in wastewater treatment.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Definition & Issues/constraints (10 h) • Constituent in wastewater & wastewater treatment methods. (14 h) • guidelines & regulation (6 h) • Types and characteristics of wastewater (10 h) • Preliminary waste water treatment (10 h) • Wastewater and Reaction rates (10 h)
Course Description	The course covers the following topics: (basic definitions of types and characteristics of wastewater, then studying the concept of wastewater treatment, then studying the wastewater treatment methods, and studying the preliminary treatment, Determinations of reaction rates and explain the design criteria.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل In class lectures 45 In Lab lectures 30 Exam 3	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 42 Prepartion for tests 20 Homeworks 10	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	15% (15)	5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments (Homeworks)	5	10% (10)	2, 4, 6, 8, 10	LO # 1, 2, 3, 4, 5 and 6
	Reports	15	15% (15)	Continuous	
Summative assessment	Midterm Exam	2	10% (10)	8	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

<table>
<tr><th colspan="2">Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري</th></tr>
<tr><td></td><td>Material Covered</td></tr>
<tr><td>Week 1</td><td>Wastewater and treatment concept :</td></tr>
<tr><td>Week 2</td><td>Types of Wastewater.</td></tr>
<tr><td>Week 3</td><td>Treatment methods,</td></tr>
<tr><td>Week 4</td><td>Treatment systems.</td></tr>
<tr><td>Week 5</td><td>Basic design considerations</td></tr>
<tr><td>Week 6</td><td>Flow rate,</td></tr>
<tr><td>Week 7</td><td>Design criteria.</td></tr>
<tr><td>Week 8</td><td>Midterm Exam</td></tr>
<tr><td>Week 9</td><td>General procedure for design calculation,</td></tr>
<tr><td>Week 10</td><td>Hydraulic flow diagram</td></tr>
<tr><td>Week 11</td><td>Reactions and reactors.</td></tr>
<tr><td>Week 12</td><td>Concept of reaction</td></tr>
<tr><td>Week 13</td><td>Concept of reactors.</td></tr>
<tr><td>Week 14</td><td>Design preliminary treatment units</td></tr>
<tr><td>Week 15</td><td>Sump and pump well</td></tr>
<tr><td>Week 16</td><td>Final Exam</td></tr>
</table>

<table>
<tr><th colspan="2">Delivery Plan (Weekly Lab. Syllabus)
المنهاج الاسبوعي للمختبر</th></tr>
<tr><td></td><td>Material Covered</td></tr>
<tr><td>Week 1</td><td>Lab 1: Determination of biochemical oxygen demand (BOD)</td></tr>
<tr><td>Week 2</td><td>Lab 2: Determination of biochemical oxygen demand (BOD), Cont'd</td></tr>
<tr><td>Week 3</td><td>Lab 3: Determination of chemical oxygen demand (COD)</td></tr>
<tr><td>Week 4</td><td>Lab 4: Determination of the pollutants by using UV- spectrophotometer</td></tr>
<tr><td>Week 5</td><td>Lab 5: Determination of the pollutants by using Flame photometer</td></tr>
<tr><td>Week 6</td><td>Lab 6: Determination of the pollutants by using Atomic Absorption</td></tr>
<tr><td>Week 7</td><td>Lab 7: Determination of the pollutants by using HPLC</td></tr>
<tr><td>Week 8</td><td>Lab 8: Determination of the functional groups by using FTIR</td></tr>
<tr><td>Week 9</td><td>Lab 9: Determination of the pollutants by using Gas Chromatography</td></tr>
</table>

Week 10	Lab 10: Determination of the molecular formula of the unknown compound by using GC-mass
Week 11	Lab 11: characterization of the solid surfaces by using Scanning electron microscope (SEM)
Week 12	Lab 12: Determination of Kjeldahl Nitrogen
Week 13	Lab 13: Determination of the sludge volume index
Week 14	Lab 14: Determination the area required for the sludge thickening
Week 15	Lab 15: Determination of oil and grease

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Wastewater treatment and reuse, Metcalf & Eddy, Fourth Edition, 2014**	Yes
Recommended Texts	**Wastewater Treatment Concept and design**	Yes
Websites	N/A	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	HAZARDOUS AND RADIOACTIVE WASTE MANAGEMENT	**Module Delivery**	
Module Type	CORE		
Module Code	ENVR-ENG-308	Theory Tutorial	
ECTS Credits	4		
SWL (hr/sem)	100		

Module Level	3	**Semester (s) offered**	2
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Dr. Salwa H. Ahmed	**e-mail**	dr.salwahadi@tu.edu.iq
Module Leader's Acad. Title	Assist Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. Nadia N. Sabeeh	**e-mail**	Eng.nadianazhat@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	SWMG-301	**Semester**	1
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	Enabling students to know the types of hazardous materials, their characteristics, sources, and their impact on humans and the environment, methods of dealing with them and limiting their quantities to the environment, and methods of treatment.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	- Be able to understand the basic Concepts of Classification of Hazardous Wastes. 2- Be able to understand Generation, Source of Hazardous Wastes. 3- Learn how to Processing, Disposal, Planning of Hazardous Wastes. 4- Be able to be familiar with Purposes of Hazardous Waste Spillage. 5- Be able to understand Generation, Source of Hazardous Wastes. 6- Be able to be familiar with Hazardous wastes Incineration. 7- Learn the principle of properties of Hazardous Wastes.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Introduction of Hazardous (3 hrs) • Pathways, Fates, and Disposition of Hazardous Waste Releases (6 hrs) • Hazardous Waste Sources/Generators (3 hrs) • Transportation of Hazardous Wastes (3 hrs) • Treatment and Disposal Methods and Processes (9hrs) • Pollution Prevention, Waste Minimization, Reuse, and Recycling (6 hrs) • Radioactive Waste Management (12 hrs) • Hazardous Waste Worker Health and Safety (3 hrs)
Course Description	This course aims to introduce students to hazardous materials, their characteristics, sources and methods of transmission in air, water or soil, their storage and transmission methods for the purposes of safe treatment, as well as identifying the types of radioactive waste and their sources and their impact on workers and the environment.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **45** **In class tests** **3**	**48**	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا 3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** **10** **Preparation for tests** **12** **Home works** **15** **Reports** **8** **Posters** **7**	**52**	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا 3.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	**100**	

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (20)	2,5, 10, 12, 14	LO #1, 2, 3, and 4
	Assignments	6	10% (10)	Continuous	LO # 1, 2, 3, 4, 5,6 and 7
	discussion	2	10% (10)	Continuous	all
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction of Hazardous
Week 2	Pathways, Fates of Hazardous Waste Releases
Week 3	Disposition of Hazardous Waste Releases
Week 4	Hazardous Waste Sources/Generators
Week 5	Transportation of Hazardous Wastes
Week 6	Disposal Methods of H. W.
Week 7	**Midterm exam**
Week 8	Treatment Methods of H. W.

Week 9	Processes of H. W.
Week 10	Pollution Prevention, Waste Minimization.
Week 11	Reuse, and Recycling
Week 12	Radioactive Waste Management
Week 13	Radiation Protection
Week 14	High, Low -Level Radioactive Waste Management.
Week 15	Hazardous Waste Worker Health and Safety
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	"Basic Hazardous waste management" by William C. Blackman, Jr., 2001, 3rd, CRC Press LLC Lewis Publishers is an imprint of CRC Press LLC	Yes
Recommended Texts	1.Lawrence K. Wang, Mu-Hao Sung Wang, Yung-Tse Hung, Nazih K. Shammas, and Jiaping Paul Chen, 2018 " Handbook of Advanced Industrial and Hazardous Wastes Management" Taylor & Francis Group, LLC.2. Richard J. Watts , 1997 " Hazardous Waste , Sources, Pathways, Receptor" 3. F. Bennett, Frank S. Feate, Ira Wilder, 1982, "Hazardous Materials Spills Handbook. Gary"	No
Websites	-

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	**التقدير**	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		

Module Title	HEAT TRANSFER		Module Delivery	
Module Type	CORE		**Theory** **Tutorial**	
Module Code	ENVR-ENG-305			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	3	Semester (s) offered	1	
Min number of students	15	Max number of students	100	
Administering Department	Environmental Engineering	College	Engineering	
Module Leader	Ahmed Y. Radeef	e-mail	Ahmed.y.radeef@tu.edu.iq	
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	PhD	
Module Tutor	None	e-mail	None	
Peer Reviewer Name	Dr. Salwa H. Ahmed	e-mail	dr.salwahadi@tu.edu.iq	
Review Committee Approval	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, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1) To be able to understand the basic concepts of **Heat Transfer** and its classifications. 2) To be able to understand how to calculate and distinguish the conduction and convection phenomena. 3) To be able to understand what is the difference between heat rate and heat flux. 4) Learn the principle of heat transfer in conduction systems. 5) Learn the principle of heat transfer in convection systems. 6) Learn the principle and applications of the heat exchangers.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Understand the concepts of the Heat Transfer. 2) Calculate and distinguish the heat rate. 3) Calculate and distinguish the heat flux. 4) Understand the concept of the steady and unsteady-heat conduction in one and multiple dimensions. 5) Understand the concept of the heat convection. 6) Knowing the general information about heat radiation and the concept of black bodies. 7) Learn the principle and general information about heat exchanger and its design.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Heat Transfer concept and its classifications (6 hrs) • Steady-State Conduction (12 hrs) • Unsteady-State Conduction (3 hrs) • Convection Heat Transfer (6 hrs) • Forced and Natural Convection Heat Transfer (12 hrs) • Radiation Heat Transfer (3 hrs) • Heat exchangers (3 hrs)
Course Description	Heat Transfer is concerned with the study of principles of heat energy transfer with very high accuracy. The aim of this course is to know the most important classifications of Heat Transfer and the most general equations in it, especially the phenomena of conduction and convection and their equations, in addition to knowing the concept of heat rate and heat flux. Finally, the applications of the heat transfer concepts in the real field especially the heat exchangers design and uses. All of this course will be used in a way that save the environment and serve the environmental sciences and knowing how and the importance of using each topic in the environmental engineering.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **45** **In class tests** **3**	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing 22** **Preparation for tests** **15** **Homeworks** **15**	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	16% (16)	3, 7, 10, 14	LO #1, 2, 3, 4, and 5
	Assignments	15	24% (24)	All	All
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-4
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction to Heat Transfer concept and its classifications
Week 2	Introduction to Heat Transfer concept and its classifications, Cont'd
Week 3	Steady-State Conduction One Dimension
Week 4	Steady-State Conduction One Dimension, Cont'd
Week 5	Steady-State Conduction Multiple Dimensions
Week 6	Steady-State Conduction Multiple Dimensions, Cont'd

Week 7	Unsteady-State Conduction, **Midterm Exam**
Week 8	Principles of Convection
Week 9	Principles of Convection, Cont'd
Week 10	Empirical and Practical Relations for Forced-Convection Heat Transfer
Week 11	Empirical and Practical Relations for Forced-Convection Heat Transfer, Cont'd
Week 12	Natural Convection Systems
Week 13	Natural Convection Systems, Cont'd
Week 14	Radiation Heat Transfer
Week 15	Heat Exchangers
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	*Heat Transfer Tenth Edition by* Holman, J. P., *Southern Methodist University*, 2010.	Yes
Recommended Texts	*Fundamentals of Heat and Mass Transfer Eighth Edition by* Bergman, T. L., Bergman, T. L., Incropera, F. P., Dewitt, D. P., and Lavine, A. S., John Wiley & Sons, 2018.	No
Websites	N/A	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information
معلومات المادة الدراسية

Module Title	MASS TRANSFER	Module Delivery	
Module Type	CORE		
Module Code	ENVR-ENG-309	Theory Tutorial	
ECTS Credits	4		
SWL (hr/sem)	100		

Module Level	3	Semester (s) offered	2
Min number of students	15	Max number of students	100
Administering Department	Environmental Engineering	College	Engineering
Module Leader	Dr. Haneen A. Kh. Karaghool	e-mail	haneen82@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	-
Peer Reviewer Name	Dr. Waleed M. Sh. Alabdraba	e-mail	walabdraba@tu.edu.iq
Review Committee Approval	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, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر
Module Aims أهداف المادة الدراسية	This course provides students with the fundamentals governing the mass transfer and the principles governing a range of processes such as absorption, distillation, leaching, and liquid extraction. Students will apply their theoretical knowledge to the design and evaluation of these processes. The objective is to give students the theoretical and analytical foundation they need to comprehend mass transfer procedures, apply them, and solve the kinds of challenging issues.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the basic modes of mass transfer. 2. Identify the Molecular Diffusion. 3. Understand Fick's Law of Diffusion. 4. Apply principles of mass transfer to predict transfer coefficients. 5. Identify the mass transfer operations. 6. Evaluate the number of stages required for a given mass transfer problem.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: • Mass transfer operations, molecular diffusion in fluid (6 hrs.) • Fick's law of diffusion, equation of continuity (6 hrs.) • Theories of mass transfer (6 hrs.) • Application of molecular diffusion, theories of mass transfer (12hrs.) • Counter and co-current isothermal absorption and stripping of a single component, and minimum flow rate (9hrs.) • Steam distillation, and flash vaporization (6 hrs.)
Course Description	This course will provide an overview of mass transfer operations at the basic to intermediate level. Coverage will be relatively broad. This course applies the concepts of diffusion and interphase mass transfer to the analysis of different mass transfer operations such as distillation. The scope of coverage will be fair. In this course, the concepts of diffusion and interphase mass transfer are applied to the examination of several mass transfer processes, including distillation and absorption. is course has a strong emphasis on principles and fundamentals of mass transfer and solving industrial-related problems. Students will learn useful analytical methods for studying and solving steady-state and unsteady-state mass transfer problems.
	Learning and Teaching Strategies استراتيجيات التعلم والتعليم
Strategies	The learning and teaching **strategy** is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 45 **In class tests** 3	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 22 **Preparation for tests** 22 **Homework** 15	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time (hr.)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	16% (16)	3, 7, 10, 14	LO # 1, 3,5, and 6
	Assignments (Homework)	15	24% (24)	All	LO # 1, 2, 3, and 4
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-4
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction & Overview of Mass Transfer Operation
Week 2	Molecular and Eddy Diffusion, Diffusion velocities, and Fluxes
Week 3	Fick's First and Second Law
Week 4	Steady-state molecular diffusion in fluids under stagnant and laminar flow conditions
Week 5	Diffusion through the variable cross-sectional area
Week 6	Gas phase diffusion coefficient measurement, Gas phase diffusion coefficient Prediction
Week 7	liquid phase diffusion coefficient measurement and prediction
Week 8	**Mid-Term Exam**
Week 9	Mass transfer coefficient concept and classifications
Week 10	Mass transfer coefficient in laminar flow

Week 11	: Mass transfer theories, Interphase mass transfer
Week 12	Introduction to absorption, Equilibrium in gas-liquid system
Week 13	Design of packed column absorber based on the Individual Mass Transfer Coefficient
Week 14	Introduction to distillation,
Week 15	Distillation in packed towers
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	**Anantharaman, N., and KM Meera Sheriffa Begum. Mass Transfer: Theory and Practice. PHI Learning Pvt. Ltd., 2017.**	No
Recommended Texts	**R. E. Treybal, Mass Transfer Operations, 3rd Ed., McGraw -Hill International Edition, 1981.** **Welty, Wicks, Wilson, Rorrer, Fundamentals of Momentum, Heat, and Mass Transfer, 6th ed., John Wiley & Sons, Inc., 2014. ISBN: 0-470-50481-1**	No

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	NOISE POLLUTION	**Module Delivery**	
Module Type	CORE	Theory Seminar	
Module Code	ENVR-ENG-311		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	2	**Semester (s) offered**	2
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Dr. Haneen A. Kh. Karaghool	**e-mail**	haneen82@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	-
Peer Reviewer Name	Dr. Waleed M. Sh. Alabdraba	**e-mail**	walabdraba@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

<table>
<tr><td colspan="4" align="center">**Relation with Other Modules**
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>**Prerequisite module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
<tr><td>**Co-requisites module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
</table>

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

<table>
<tr>
<td>**Module Aims**
أهداف المادة الدراسية</td>
<td>Noise pollution, commonly referred to as environmental noise or sound pollution, is the spread of noise that negatively affects human or animal behavior. The module's objectives include educating the student about noise pollution as well as regulating and controlling sources that generate and produce noise.</td>
</tr>
<tr>
<td>**Module Learning Outcomes**

مخرجات التعلم للمادة الدراسية</td>
<td>
1. Identify the sources of noise pollution and understand their effects on public health and the environment.
2. Monitor the indoor and outdoor noise pollution quality.
3. Measure the sound level according to its pressure and intensity.
4. Examine the sound wave mechanics.
5. Examine ways to control Noise Pollution and understand the concepts involved in control technologies.
6. Provide preventive and control measures for noise generated within our environment.
</td>
</tr>
<tr>
<td>**Indicative Contents**
المحتويات الإرشادية</td>
<td>
Indicative content includes the following:
- Introduction: Sources of Noise Pollution (12 hrs.)
- Effects of Noise Pollution (12 hrs.)
- Noise Measurement, Assessment, and Evaluation (15hrs.)
- Noise Control and Protection of the receiver (6hrs.)
</td>
</tr>
<tr>
<td>**Course Description**</td>
<td>With increasing noise pollution nationally and globally, it is necessary to be familiar with basic information regarding noise pollution to allow a proper assessment of impacts arising from the various projects or activities and devising appropriate mitigation or control measures. In this respect, the Noise Pollution course is subdivided into two sections: the general introductory, and noise pollution sections. The general introductory section covers information on national standards and regulations governing noise levels; definitions of noise pollution. The noise pollution section covers sources, characteristics, and effects of industrial, transportation and urban noise; measurement, assessment and evaluation of noise; control of noise and protection of recipients.</td>
</tr>
</table>

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)				
الحمل الدراسي للطالب				
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
In class lectures 30 **Seminar** 15 **In class tests** 3				
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.47
Library, dorm, home memorizing 20 **Preparation for tests** 20 **Homework** 12				
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل		100		

Module Evaluation
تقييم المـادة الدراسية

		Time (hr.)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	16%(16)	3, 7, 10, 14	All
	Assignments	10	16%(16)	All	LO # 1, 2, 3, and 4
	Seminar	15	8%(8)	Continues	
Summative assessment	**Midterm Exam**	2	10%(10)	9	LO # 1-4
	Final Exam	3	50%(50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction and terminology
Week 2	Noise Sources and typical range of noise levels
Week 3	Noise Measurement
Week 4	The Mechanism of Hearing and Health Impacts of Noise
Week 5	Noise Pollution Effects the Environment
Week 6	Sound Wave Mechanics
Week 7	Plane and spherical sound waves
Week 8	Wave Length, Speed, and Frequency of sound wave
Week 9	**Mid-Term Exam**
Week 10	acoustic power

Week 11	The sound Intensity level and sound Pressure Level
Week 12	Frequency sensitivity and equal loudness characteristics
Week 13	Propagation of Sound Outdoors and Environmental Factors
Week 14	Noise Control and Protection of Receiver
Week 15	Equipment to Measure Sound and Practical Environmental Noise Measurement
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**PE Cunniff, (1987), Environmental Noise Pollution, McGraw Hill, New York.**	No
Recommended Texts	**Peterson & EE Gross PH, Englewood cliffs, Handbook of Noise Measurement – APG New Jersey, latest edition.** **Cowan, J.P. (1994) Handbook of Environmental Acoustics. New York: Van Nostrand Reinhold.** **Smith, B.J., Peters, R.J. and Owen, S. (2001) Acoustic and Noise Control. Second edition. Essex: Longman Group.**	No

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	NUMERICAL ANALYSIS	**Module Delivery**
Module Type	BASIC	Theory Tutorial
Module Code	MATH-301	
ECTS Credits	4	
SWL (hr/sem)	100	
Module Level	3	**Semester (s) offered**	2
Min number of students	15	**Max number of students**	100
Administering Department	Civil Engineering	**College**	Engineering
Module Leader	Dr. Adnan Jayed Zedan	**e-mail**	Jayedadn@tu.edu.iq
Module Leader's Acad. Title	Assist. Prof.	**Module Leader's Qualification**	Ph.D.
Module Tutor	Mohamed Burhan Ali	**e-mail**	mohamedburhan@tu.edu.iq
Peer Reviewer Name	Dr. Adnan Jayed Zedan	**e-mail**	Jayedadn@tu.edu.iq
Review Committee Approval	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, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	To enhance the problem-solving skills of engineering students using an extremely powerful problem-solving tool namely numerical method. The tool is capable of handling large system of equations, non-linearities and complicated geometries that are not uncommon in engineering practice and that are often impossible to solve analytically.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of this course students will be able to: 1- Understand numerical techniques to find the roots of non-linear equations and solution of system of linear equations. 2- Understand the difference operators and the use of interpolation. 3- Understand numerical differentiation and integration and numerical solutions of ordinary and partial differential equations.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • System of Linear Algebraic Equations (12hrs) • Open Methods to Estimate Root (6hrs) • Curve Fitting (9hrs) • Numerical Integration (3hrs) • Numerical Differentiation (3hrs) • Ordinary Differential Equations (6hrs) • Partial Differential Equations (6hrs)
Course Description	The course is designed to provide the students with a comprehensive understanding of various numerical techniques used in solving mathematical problems that are challenging or impossible to solve analytically. This course focuses on the theoretical foundations, practical implementation, and applications of numerical methods in diverse fields of engineering. Throughout the course, students will develop a solid foundation in numerical analysis to solve complex mathematical problems.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	1- Engage students in active learning activities such as problem-solving exercises, group discussions. Encourage students to actively participate in class, ask questions, and share their insights. 2- Use real-world examples and applications to illustrate the relevance of numerical methods. Connect the concepts and techniques learned in class to their practical use in engineering. 3- Break down complex numerical methods into step-by-step procedures, highlighting the underlying principles and assumptions at each stage.

This approach helps students grasp the logic behind the methods and enhances their problem-solving skills.

4- Encourage collaborative learning through group projects or problem-solving sessions. Students can work together to solve complex numerical problems, exchange ideas, and learn from each other's perspectives.

Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **45** **In class tests** **3**	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing 17** **Preparation for tests** **15** **Homeworks** **20**	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation					
تقييم المادة الدراسية					
		Time (hr)	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	10% (10)	2,6,10,14	LO #1, 2, and 3
	Assignments	6	30% (30)	All	LO # 1, 2, and 3
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-2
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Mathematical Background:- Matrix- Matrix operations - Determinant - Matrix inversion
Week 2	System of Linear Algebraic Equations: Gauss Elimination
Week 3	System of Linear Algebraic Equations: Matrix Inversion
Week 4	System of Linear Algebraic Equations: The Gauss-Seidle Method
Week 5	Open Methods to Estimate Root: The Newton Raphson Method

Week 6	Open Methods to Estimate Root: The Secant Method
Week 7	Curve Fitting: Linear Regression, **Midterm Exam**
Week 8	Curve Fitting: Newton's Divided-Difference Interpolation Polynomials
Week 9	Curve Fitting: Lagrange Interpolation Polynomials
Week 10	Numerical Integration - The Trapezoidal Rule- Simpson Rules
Week 11	Numerical Differentiation-Richardson Extrapolation
Week 12	Ordinary Differential Equations- Euler's Method- Modified Euler's Method
Week 13	Ordinary Differential Equations - Runge -Kutta Methods
Week 14	Partial Differential Equations- Finite Difference. Elliptic Equations
Week 15	Partial Differential Equations- Finite Difference. Parabolic Equations
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Numerical Methods for Engineers. By Stephen Chapra	Yes
Recommended Texts		
Websites		

APPENDIX:

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
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 – 49)	**FX –** Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	SOIL AND GROUNDWATER POLLUTION	**Module Delivery**
Module Type	CORE	Theory Tutorial Lab
Module Code	ENVR-ENG-306	
ECTS Credits	7	
SWL (hr/sem)	175	

Module Level	3	Semester (s) offered	2
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Naser Abesd Hassan	**e-mail**	Naser.a.Hassan@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	MSc
Module Tutor	Hassan Ali Ahmed	**e-mail**	hassanali@st.tu.edu.iq
Peer Reviewer Name	Waleed M. Sh. Alabdraba	**e-mail**	walabdraba@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Engineering Geology	**Semester**	2,2
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	تهدف المادة الى تعريف الطلبة بمفهوم التربة الملوثة ومصادره واسبابه والذي يؤثر على التربة والاثار السلبية الناجمة عن كل نوع وطرق السيطرة والاساليب الهندسية المستخدمة للسيطرة على كل نوع.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. الالمام بالمفاهيم الاساسية لعلم التربة والمياه الجوفية 2. معرفة تركيبة التربة وخصائصها 3. فهم التلوث البيئي الذي تتعرض له التربة وانواع التلوث الرئيسية 4. القدرة على التعامل مع انواع الملوثات 5. معرفة كيفية السيطرة على الملوثات في واقع الحياة 6. القدرة على فهم اهم الطرق المتبعة للمعالجة
Indicative Contents المحتويات الإرشادية	1. تعريف التربة ,مكوناتها, عوامل تكون التربة. (3 ساعات) 2. الخواص الفيزياوية للتربة, هواء التربة ,ماء التربة, لون التربة (3 ساعات) 3. العلاقات الوزنية والحجمية للتربة (6 ساعات) 4. حدود اتربيرج (3 ساعات) 5. تصنيف التربة حسب النظام التصنيف الموحد (3 ساعات) 6. تصنيف التربة حسب طريقة مثلث ميسيسبي (3 ساعات) 7. جريان الماء خلال التربة (6 ساعات) 8. خواص التربة الكيمياوية , مجاميع التربة الرئيسية (3ساعات) 9. سعة التبادل الايوني ,حموضة التربة واهميتها وطرق قياسها (6 ساعات) 10. الغرويات المعدنية , الغرويات العضوية (3 ساعات) 11. الملوحة والقلوية في التربة ,تصنيف الترب المتأثرة بالاملاح,تعيين ملوحة التربة 12. (6 ساعات) 13. الشد الازموزي , استصلاح الترب المتأثرة بالاملاح (6 ساعات) 14. الخواص البيلوجية للتربة, المجاميع الرئيسية لاحياء التربة (6 ساعات) 15. دورة الكاربون والنيتروجين في الطبيعة نسبة الكاربون الى النيتروجين(3 ساعات) 16. التلوث بالمصادر الكيمياوية الزراعية , المبيدات وانواعها (6 ساعات) 17. استخدامات المبيدات وتأثيراتها البيئية على التربة والمياه الجوفية (6ساعات) 18. الخصائص النوعية للمبيدات (6ساعات) 19. التعرية الريحية , التصحر اسباب التصحر وطرق المعاجة(5 ساعات) 20. المعادن الثقيلة والخفيفة في التربة , استعمالاتها , جاهزيتها للانتقال الى نظام التربة (9 ساعات)
Course Description	يغطي هذا الموضوع مقدمة عامة عن خواص التربة كالنفاذية والتسرب وكذلك دراسة الخصائص الفيزيائية والكيميائية والبيولوجية للتربة وطرق تصنيفها بالإضافة للتلوث اذي تتعرض له التربة وطرق معالجتها

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	تم تصميم استراتيجية التعلم والتدريس من أجل: تغطية المواد الأساسية والتقنيات التحليلية بعناية في المحاضرات ، وإظهار المفاهيم بأمثلة مناسبة وعملية تتيح للطلاب وقتًا كافيًا لممارسة التقنيات باستخدام عدد كبير من الطرق التعليمية المختارة بعناية.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل			Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	
In class lectures	**60**	93		6.2
In Lab lectures	**30**			
In class tests	**3**			
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل			Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Library, dorm, home memorizing	**40**	82		5.47
Preparation for tests	**28**			
Homeworks	**14**			
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل		175		

Module Evaluation
تقييم المادة الدراسية

	As	Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	15%(15)	3, 5, 8, 10, 12	LO #1, 2, 3, and 4
	Assignments (Homeworks)	10	10%(10)	2, 4, , 8, 10	LO # 1, 2, 3, 4, 5 and 6
	Reports	15	15 %(15)	Continuous	
Summative assessment	**Midterm Exam**	2	10%(10)	8	LO # 1-5
	Final Exam	3	50%(50)	16	All
Total assessment			100%(100 MARKS)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

Week	Material Covered
Week 1	تعريف التربة ,مكوناتها, عوامل تكون التربة الخواص الفيزياوية للتربة, هواء التربة ,ماء التربة, لون التربة
Week 2	العلاقات الوزنية والحجمية للتربة
Week 3	حدود اتربيرج تصنيف التربة حسب النظام التصنيف الموحد
Week 4	تصنيف التربة حسب طريقة مثلث ميسيسبي جريان الماء خلال التربة
Week 5	خواص التربة الكيمياوية , مجاميع التربة الرئيسية
Week 6	سعة التبادل الايوني ,حموضة التربة واهميتها وطرق قياسها

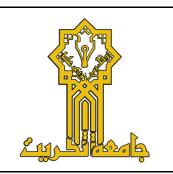|	
	الغرويات المعدنية , الغرويات العضوية
Week 7	الملوحة والقلوية في التربة ,تصنيف الترب المتأثرة بالاملاح,تعيين ملوحة التربة
Week 8	**Midterm Exam**
Week 9	الشد الازموزي , استصلاح الترب المتأثرة بالاملاح الخواص البيلوجية للتربة, المجاميع الرئيسية لاحياء التربة
Week 10	دورة الكاربون والنيتروجين في الطبيعة نسبة الكاربون الى النيتروجين
Week 11	التلوث بالمصادر الكيمياوية الزراعية , المبيدات وانواعها
Week 12	استخدامات المبيدات وتأثيراتها البيئية على التربة والمياه الجوفية
Week 13	الخصائص النوعية للمبيدات
Week 14	التعرية الريحية , التصحر اسباب التصحر وطرق المعالجة
Week 15	المعادن الثقيلة والخفيفة في التربة , استعمالاتها , جاهزيتها للانتقال الى نظام التربة
Week 16	**Final Exam**

Analytical chemistry (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
Week	**Material Covered**
Week 1	يتم استخدام هذا الفحص لتحديد توزيع حجم حبيبات (Particle Size Analysis): تحليل الحبيبات الصغيرة Lab1 التربة وتصنيفها وفقًا للمقاييس القياسية المعتمدة
Week 2	يتم استخدام هذا الفحص لتحديد الرطوبة النسبية للتربة (Water content : تحديد الرطوبة النسبية (Lab 2
Week 3	يتم استخدام هذا الفحص لتحديد الوزن النوعي للتربةSpecific Gravity: تحديد الوزن النوعي (Lab 3)
Week 4	Atterberg Limits Test: فحص حدود اتربيرك (Lab 4 Liquid Limit Testاختبار الرطوبة القصوى (: يهدف إلى تحديد الحد الأعلى للرطوبة التي يمكن أن تتحول فيها التربة من الحالة السائلة إلى الحالة البلاستيكية). يتم قياس تغير المقاومة أثناء تمرير جهاز يعرف بمطرقة كاساجراند.
Week 5	Plastic Limit Test : اختبار الحد البلاستيكي (Lab 5): يحدد الحد الأدنى للرطوبة التي يمكن أن تحافظ على التربة في الحالة البلاستيكية بعد أن تكون فقدت رطوبتها القصوى. يتم تحديد الحد البلاستيكي عندما تتحول التربة إلى حالة قابلة للتشكيل باليد.
Week 6	Shrinkage Limit Testاختبار الحد الحبيبي (Lab 6): يحدد الحد الأدنى للرطوبة التي يمكن أن تحافظ عليها التربة بعد أن تكون فقدت رطوبتها البلاستيكية. يتم قياس انقباض التربة أثناء جفافها من الحالة البلاستيكية إلى الحالة الصلبة.
Week 7	Density Test.: فحص الكثافة (Lab 7): يستخدم لتحديد الكثافة الحقلية والكثافة الرطبة والكثافة الجافة للتربة.
Week 8	Lab 8 قياس الدالة الحامضية : PHفي محلول التربة,يتم قياس النشاط المولي لايونات الهيدروجين للتربة
Week 9	Lab 9 قياس المواد الصلبة الذائبة : TDSيتم قياس اجمالي المواد الذائبة
Week 10	Constant Head Permeability): قياس معامل النفاذية (Lab 10
Week 11	Heavy Metals Analysis : تحليل المعادن الثقيلة (Lab 11): يستخدم لكشف وقياس تراكيز المعادن الثقيلة في التربة، مثل الرصاص والزئبق والكادميوم، التي قد تنتج عن أنشطة صناعية أو استخدام المبيدات الزراعية.
Week 12	Pesticides Analysis : تحليل المبيدات الزراعية (Lab 12): يستخدم لاكتشاف وتحديد تراكيز المبيدات الزراعية في التربة، والتي يمكن أن تسبب تلوثاً بيئياً وتأثيرات سلبية على الصحة العامة.
Week 13	Oil and Petroleum Analysis : تحليل الزيوت النفطية (Lab 13): يستخدم لتحديد وفحص تلوث التربة بالزيوت النفطية والمشتقات البترولية، والتي قد تحدث نتيجة تسرب النفط أو تلوث منشآت الصناعة النفطية.

Week 14	اختبار الاستجابة الكيميائية للجبس المعروف أيضًا باسم "اختبار سولفات الكالسيوم الذائبة" أو "اختبار Lab 14 جبس سولفات الكالسيوم الذائبة". الفحص يستخدم لتحديد وجود الجبس في التربة
Week 15	اختبار نفاذية التربة او اختبار التسرب للتربة : يهدف هذا الاختبار إلى تحديد مدى قدرة التربة على تمرير Lab 15 الماء من خلالها

<table>
<tr><th colspan="3">Learning and Teaching Resources
مصادر التعلم والتدريس</th></tr>
<tr><td></td><td>Text</td><td>Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>مبادئ علم التربة : عبدالله نجم العاني (1980)
ميكانيك التربة : محمد عمر العشو (1980)
تقييم تلوث التربة ـ سلسلة التخلص من المبيدات رقم/8 (منظمة الاغذية والزراعة للامم المتحدة)/ روما (2002)
تلوث الماء الجوفي : د احمد الخطيب (1993)</td><td>No</td></tr>
<tr><td>Recommended Texts</td><td>مبادئ علم التربة : عبدالله نجم العاني (1980)
تلوث الماء الجوفي : د احمد الخطيب (1993)</td><td>No</td></tr>
<tr><td>Websites</td><td colspan="2">N/A</td></tr>
</table>

APPENDIX:

<table>
<tr><th colspan="5">GRADING SCHEME
مخطط الدرجات</th></tr>
<tr><td>Group</td><td>Grade</td><td>التقدير</td><td>Marks (%)</td><td>Definition</td></tr>
<tr><td rowspan="5">Success Group
(50 - 100)</td><td>A - Excellent</td><td>امتياز</td><td>90 - 100</td><td>Outstanding Performance</td></tr>
<tr><td>B - Very Good</td><td>جيد جدا</td><td>80 - 89</td><td>Above average with some errors</td></tr>
<tr><td>C - Good</td><td>جيد</td><td>70 - 79</td><td>Sound work with notable errors</td></tr>
<tr><td>D - Satisfactory</td><td>متوسط</td><td>60 - 69</td><td>Fair but with major shortcomings</td></tr>
<tr><td>E - Sufficient</td><td>مقبول</td><td>50 - 59</td><td>Work meets minimum criteria</td></tr>
<tr><td rowspan="2">Fail Group
(0 – 49)</td><td>FX – Fail</td><td>مقبول بقرار</td><td>(45-49)</td><td>More work required but credit awarded</td></tr>
<tr><td>F – Fail</td><td>راسب</td><td>(0-44)</td><td>Considerable amount of work required</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">Note:</td><td colspan="3"></td></tr>
<tr><td colspan="5">NB Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</td></tr>
</table>

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	Solid waste management	**Module Delivery**
Module Type	Core	
Module Code	ENVR-ENG-302	Lecture
ECTS Credits	5	Tutorial
SWL (hr/sem)	125	
Module Level	3	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Mohammed M. Numaan	**e-mail**	Mohammed.m.numaan@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	
Peer Reviewer Name	Dr. Waleed M. Sh. Alabdraba	**e-mail**	walabdraba@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

<table>
<tr><td colspan="4" align="center">**Relation With Other Modules**
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>**Prerequisite module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
<tr><td>**Co-requisites module**</td><td>Hazardous & Radioactive Waste Management</td><td>**Semester**</td><td>2</td></tr>
<tr><td colspan="4" align="center">**Module Aims, Learning Outcomes, Indicative Contents and Brief Description**
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر</td></tr>
<tr><td>**Module Aims**
أهداف المادة الدراسية</td><td colspan="3">1. To define the types of solid waste to manage them in engineering patterns.
2. To provide experience in the analysis of pollution problems
3. To sustain the environmental resources using proper operations to manage the waste, e.g., 4Rs.
4. To define the important methods of collection, storage, processing & disposal.
5. To provide design of collection routes, sanitary landfilling, and incinerators.</td></tr>
<tr><td>**Module Learning Outcomes**
مخرجات التعلم للمادة الدراسية</td><td colspan="3">On completion of this course, students will be able to:
• Be able to understand the basic Concepts of Solid waste management.
• Be able to understand the collection services of solid wastes.
• Learn how to analyze Collection Systems of solid wastes.
• Be able to be familiar with Onsite Storage, and Onsite Processing of Solid Wastes.
• Be able to understand the types of collection systems of solid wastes.
• Be able to be familiar with solid waste quantities.
• Learn the principle of generation rates of solid wastes.
• Be able to understand the basic concepts of Processing techniques.
• Be able to understand the Design of Landfills.
• Learn how to select, Landfilling Methods and Operations.
• Be able to be familiar with the Purposes of Processing, Mechanical Volume Reduction, Selection of Compaction Equipment
• Be able to understand Screening, Other Separation Techniques, Drying, and Dewatering.
• Be able to be familiar with Solid Waste filling Plan, Types of Wastes, and Ocean Disposal of Solid Wastes.
• Learn the principle of Materials Processing and Recovery Systems.</td></tr>
<tr><td>**Indicative Contents**
المحتويات الإرشادية</td><td colspan="3">Indicative content includes the following.
• Waste generation. (4 hr)
• Source and Types of Solid Waste. (4 hr)
• Composition of Municipal Solid Wastes and Compositing. (4 hr)
• Generation Rates. (4 hr)
• Collection services. (4 hr)
• Collection System, Equipment, and Labor Requirements. (4 hr)
• Transfer operation. (4 hr)
• Selection of Compaction Equipment. (4 hr)
• Materials Processing and Recovery Systems. (4 hr)</td></tr>
</table>

	• Recovery of Chemical Conversion Products. (4 hr)
	• Recovery of Biological Conversion Products. (4 hr)
	• Disposal of Solid Wastes and Residual Matter. (4 hr)
	• Site selection, Land filling Methods, and Operations. (4 hr)
	• Design of Landfills, Land Requirements, and Landfill Operation Plan. (4 hr)
	• Solid Waste filling Plan, Types of Wastes, Ocean Disposal of Solid Wastes. (4 hr)
Course Description	This course covers fundamental aspects of solid & hazardous waste includes handling & treatment methods, in addition of measurement of their concentrations & the manners in which they affect the environmental & ecological systems.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In-class lectures** **60** **In-class tests** 3	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 22 **Preparation for tests** **20** **Homeworks** **20**	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	1	20% (20)	All	LO #1, 2, 3, and 4
	Assignments	5	20% (20)	All	LO # 1, 2, 3, 4, 5 and 6
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

	Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered	
Week 1	Waste generation, Functional Elements, Source and Types of Solid Wastes	
Week 2	Composition of Municipal Solid Wastes and Compositing.	
Week 3	Collection System, Equipment and Labor Requirements.	
Week 4	Transfer operation, Onsite Processing of Solid Wastes	
Week 5	Purposes of Processing, Mechanical Volume Reduction, Selection of Compaction Equipment.	
Week 6	Chemical Volume Reduction, Mechanical Size Reduction, Size Reduction Equipment.	
Week 7	**Midterm Exam**	
Week 8	Component Separation, Hand sorting, Air Separation, Magnetic Separation.	
Week 9	Screening, Other Separation Techniques, Drying and Dewatering, Materials Processing and Recovery Systems.	
Week 10	Recovery of Chemical Conversion Products, Recovery of Biological Conversion Products.	
Week 11	Recovery of Energy from Conversion Products.	
Week 12	Disposal of Solid Wastes and Residual Matter, Site selection, Land filling Methods and Operations.	
Week 13	Reactions Occurring in Completed Landfills, Gas and Leachate, Movement and Control.	
Week 14	Design of Landfills, Land Requirements, Landfill Operation Plan.	
Week 15	Solid Waste filling Plan, Types of Wastes, Ocean Disposal of Solid Wastes.	
Week 16	**Final Exam**	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Integrated Solid Waste Management's. By Tchobanoglous Mc-Grow Hill 1993	Yes
Recommended Texts		No
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:	

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

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	Sᴛᴀᴛɪsᴛɪᴄ ᴀɴᴅ ᴘʀᴏʙᴀʙɪʟɪᴛʏ	**Module Delivery**
Module Type	Bᴀsɪᴄ	**Theory** **Tutorial**
Module Code	MATH-302	
ECTS Credits	4	
SWL (hr/sem)	100	

Module Level	3	Semester (s) offered	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Nizar N. Ismaeal	**e-mail**	Dr.nizar1961@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	PhD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. Adnan Jayed Zedan	**e-mail**	Jayedadn@tu.edu.iq
Review Committee Approval	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, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	1) To provide definition of statistic and give necessary idea. 2) To explain the concept of data collection and representation. 3) To give information about how to make data tabled. 4) To explain the descriptive statistics. 5) To calculate central and variation measurement. 6) To give information about investigative statistics. 7) To explain probability laws. 8) To make analysis and decision.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Use both conceptual and numerical techniques to solve engineering problems. 2) Analyze and make decision. 3) Understand and use the general idea of statistics of a particle. 4) Understand and use the general ideas probability. 5) Determine the distribution appropriate for any problem. 6) Analyze the data collect from field. 7) Find sample volume. 8) Understand and use the general ideas of hypothesis tests. 9) Apply data analysis by using SPSS program.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. ● Data collection and data representation. (6 hrs) ● Central and Variation measurements. (6 hrs) ● Principles of probability theory (6 hrs) ● Correlation and Regression (9 hrs) ● Hypotheses and Fitness tests (9 hrs) ● Test of variation, one-way test, two-way test. (9 hrs)
Course Description	The course covers the following topics; statistics of applications: Data collection, Data representation, Central measurements, comparisons between central measurements, Variation measurements, comparisons between Variation measurements Sampling and Estimation, Principles of probability theory, Probability Distributions, Correlation and Regression, Hypotheses and Fitness tests, Test of variation, one-way test, Test of variation, two-way test, method of virtual work.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
In class lectures 45				
In class tests 3				
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.47
Library, dorm, home memorizing 22				
Preparation for tests 20				
Homeworks 10				
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100			

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	15% (10)	2, 3, 4, 5, 6, 7	LO #1, 2, 3, and 4
	Assignments (Homeworks)	5	15% (10)	2, 4, 6, 8, 10	LO # 1, 2, 3, 4, 5 and 6
	Discussions	6	10% (20)	Continuous	
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	General principles, Principles of statistics
Week 2	Data collection, Data representation, Central measurements, Harmonic mean, median.
Week 3	Mode, comparisons between central measurements.
Week 4	Variation measurements, Range, Mean deviation, Deviation, Slandered deviation.
Week 5	Coefficient of variance, comparisons between variance measurements, sequence and measurements
Week 6	Principles of probability theory
Week 7	Sampling and Estimation
Week 8	**Midterm exam**
Week 9	Probability Distributions

Week 10	Probability Distributions
Week 11	Correlation and Regression
Week 12	Hypotheses and Fitness tests
Week 13	Hypotheses and Fitness tests
Week 14	Test of variation, one-way test.
Week 15	Test of variation, two-way test.
Week 16	**Final Exam**

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	المدخل إلى الإحصاء"-د. خاشع محمود الراوي-جامعة الموصل/كلية الزراعة والغابات .1984-	Yes
Recommended Texts	مبادئ الإحصاء الهندسي", د. باسم نزهت السامرائي، د. مثنى جبر، الجامعة التكنولوجية، دار الحكمة للطباعة والنشر، بغداد، 1990 الأساليب الإحصائية في العلوم الإدارية، تطبيقات باستخدام (spss)",د. صلاح الدين حسن إلهيتي، جامعة مؤتة، دار الوائل للطباعة والنشر، عمان 2004.	No Yes
Websites	N/A	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	TREATMENT PLANT HYDRAULICS	**Module Delivery**
Module Type	CORE	Theory Tutorial
Module Code	ENVR-ENG-303	
ECTS Credits	5	
SWL (hr/sem)	125	
Module Level	3	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Dr. Wesam S. Mohammed-Ali	**e-mail**	wisam.s.mohammed@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. Raad H. Irzooki	**e-mail**	dr.raadhoobi@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Fluid Flow	**Semester**	2
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	This course is attempted to help satisfy the required need for bringing together the information related to the hydraulic design of water and wastewater treatment facilities.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Interpret and analyses data related to flow in water treatment plants (WTP). 2. Apply the fundamental flow theories on each component of the water treatment plants. 3. Formulate the elementary principles flow in pipe systems including conservations laws, head losses in pipes, pipe series, sludge flow. 4. Understand the basics of flow measurement and hydraulics control points such. 5. Understand the basics of designing process for treatment plants.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Fluid Flow Review (4 hrs.) • Fundamental of free surface flow (16) • Fundamentals of flow measurements (20 hrs.) • Hydraulic Analysis of WTP (8 hrs.) • Case studies for designing a WTP hydraulically (10)
Course Description	This course aims to establish fundamental knowledge of hydraulic design and engineering of the water treatment plants. Students are introduced to standard hydraulic behavior inside the water treatment plant facilities. In addition, they will understand how to measure and control the flow of wastewater, which was implemented together with the conservation of mass inside the water treatment plant.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

<table>
<tr><th colspan="4">Student Workload (SWL)
الحمل الدراسي للطالب</th></tr>
<tr>
<td>Structured SWL (h/sem)
الحمل الدراسي المنتظم للطالب خلال الفصل
In class lectures   60
In class tests   3</td>
<td>63</td>
<td>Structured SWL (h/w)
الحمل الدراسي المنتظم للطالب أسبوعيا</td>
<td>4.2</td>
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<tr>
<td>Unstructured SWL (h/sem)
الحمل الدراسي غير المنتظم للطالب خلال الفصل
Library, dorm, home memorizing 30
Preparation for tests   20
HomeWorks   12</td>
<td>62</td>
<td>Unstructured SWL (h/w)
الحمل الدراسي غير المنتظم للطالب أسبوعيا</td>
<td>4.13</td>
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<td>Total SWL (h/sem)
الحمل الدراسي الكلي للطالب خلال الفصل</td>
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Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20% (20)	2, 4, 7, 10,12,14	LO #1, 2, 3, and 4
	Assignments	10	20% (20)	3, 6, 9, 12	LO # 1, 2, 3, 4, and 5
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	General introduction, dimensional analysis, units.
Week 2	Review of flow in pipes (pipes in series, parallel, and equivalent pipe).
Week 3	Introduction to pumps and pump curves.
Week 4	Pumps in series and parallel
Week 5	Open channels flow and channel geometry properties
Week 6	Critical flow and specific energy
Week 7	Critical flow and specific energy
Week 8	**Midterm Exam** + Flow measurement instruments
Week 9	Flow measurement and hydraulics control points (weir)

Week 10	Flow measurement and hydraulics control points (Venturi meter, Parshall flume)
Week 11	Hydraulics Analysis of multiport diffuser
Week 12	Hydraulics Design of multiport diffuser
Week 13	Comprehensive Design Case for Water Treatment Plants.
Week 14	Comprehensive Design Case for Water Treatment Plants.
Week 15	**Review Week before Final Exam**
Week 16	**Final Exam**

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Treatment Plant Hydraulics for Environmental, 4th Edition by Larry D. Benefield. 2015 Publisher: Prentice-Hall ISBN: 9780139302480.**	No
Recommended Texts	**Water and wastewater by Shun Dar Lin, McGraw – Hill, 2nd edition**	No
Websites	Treatment plant hydraulics for environmental engineers (1984 edition)	Open Library	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

<table>
<tr><td colspan="5" align="center">**Module Information**
معلومات المادة الدراسية</td></tr>
<tr><td>**Module Title**</td><td colspan="2">WASTEWATER TREATMENT</td><td colspan="2">**Module Delivery**</td></tr>
<tr><td>**Module Type**</td><td colspan="2">CORE</td><td colspan="2" rowspan="3">**Theory**
Tutorial</td></tr>
<tr><td>**Module Code**</td><td colspan="2">ENVR-ENG-307</td></tr>
<tr><td>**ECTS Credits**</td><td colspan="2">6</td></tr>
<tr><td>**SWL (hr/sem)**</td><td colspan="2">150</td><td colspan="2"></td></tr>
<tr><td>**Module Level**</td><td>3</td><td>**Semester (s) offered**</td><td colspan="2">2</td></tr>
<tr><td>**Min number of students**</td><td>15</td><td>**Max number of students**</td><td colspan="2">100</td></tr>
<tr><td>**Administering Department**</td><td>Environmental Engineering</td><td>**College**</td><td colspan="2">Engineering</td></tr>
<tr><td>**Module Leader**</td><td>Masood Muhsin Hazzaa</td><td>**e-mail**</td><td colspan="2">masood.mohsen@tu.edu.iq</td></tr>
<tr><td>**Module Leader's Acad. Title**</td><td>Lecturer</td><td>**Module Leader's Qualification**</td><td colspan="2">MSc</td></tr>
<tr><td>**Module Tutor**</td><td>None</td><td>**e-mail**</td><td colspan="2">None</td></tr>
<tr><td>**Peer Reviewer Name**</td><td>Dr. waleed M.Sh. Alabdraba</td><td>**e-mail**</td><td colspan="2">walabdraba@tu.edu.iq</td></tr>
<tr><td>**Review Committee Approval**</td><td>01/06/2023</td><td>**Version Number**</td><td colspan="2">1.0</td></tr>
</table>

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	WSWT-301	**Semester**	1
Co-requisites module	None	**Semester**	

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	1- Knowing the stages of wastewater treatment. 2- To explain the bio-kinetic of biological wastewater treatment. 3- To give information about the wastewater treatment methods. 4- Explanation of primary treatment. 5- Explanation of secondary treatment. 6- Determinations of reaction rates. 7- Explain the design criteria.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Use each of the conceptual techniques for wastewater treatment. 2- Knowing the design procedure of wastewater treatment units. 3- Building and analyzing mathematical models. 4- Understanding the source of wastewater generation. 5- Understanding and using the general ideas for wastewater in correct scientific ways. 6- Determine the most common applications using wastewater treatment. 7- Understanding and using the most modern techniques in wastewater treatment. 8- Understanding and calculating methods of working with modern mechanical techniques in wastewater treatment.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Definition & Issues/constraints (10 h) • Design wastewater treatment units. (14 h) • guidelines & regulation (6 h) • Types and characteristics of wastewater (10 h) • Primary and secondary units (10 h) • Secondary clarifier (10 h)
Course Description	The course covers the following topics: (Design of approach channel, equalization basins, and screen chamber, then design grit chambers, Primary settling tank, and classification of treatment process , design of secondary treatment units Design of secondary treatment units, then design secondary settling tank

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **60** **In class tests** **3**	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** **52** **Preparation for tests** **25** **Homeworks** **10**	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

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

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Design of approach channel
Week 2	Design equalization basins,
Week 3	Design of screen chamber
Week 4	Design Grit chambers
Week 5	Design aerated grit chambers
Week 6	Design of primary treatment units : Primary settling tank
Week 7	Flotation
Week 8	**Midterm Exam**

Week 9	Classification of treatment process, bio-kinetic, design consideration
Week 10	Biological treatment of wastewater: aerobic process,
Week 11	removal mechanism
Week 12	Design of secondary treatment units
Week 13	Suspended growth treatment units
Week 14	Activated sludge process
Week 15	Secondary settling tank
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	**Wastewater treatment and reuse, Metcalf & Eddy, Fourth Edition, 2014**	Yes
Recommended Texts	**Wastewater Treatment Concept and design**	Yes
Websites	N/A	

APPENDIX:

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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Fail Group (0 – 49)	**FX –** Fail	مقبول بقرار	(45-49)	More work required but credit awarded
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	Ministry of Higher Education and Scientific Research - Iraq Tikrit University College of Engineering Environmental Engineering Department	

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information معلومات المادة الدراسية		
Module Title	WATER QUALITY ENGINEERING	**Module Delivery**
Module Type	CORE	Theory Tutorial
Module Code	ENVR-ENG-304	
ECTS Credits	6	
SWL (hr/sem)	150	
Module Level	3	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Rand R. Ahmed	**e-mail**	randrafi3@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	MSc
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Assist. Prof. Dr. Salwa H. Ahmed	**e-mail**	dr.salwahadi@tu.edu.iq
Review Committee Approval	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, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1. Water resources protection and conservation 2. Water pollution prevention and control 3. Development and application of clean technology 4. Groundwater protection 5. Protection of aquatic ecosystems 6. Monitoring and surveillance of water resources and water receiving wastes 7. Development of legal instruments to protect the quality of water resources
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of this course students will be able to: 1- Ability to apply knowledge of mathematics, science, and engineering. 2-Ability to design and conduct experiments, as well as to analyze and interpret data. 3-Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. 4-Ability to function on multi-disciplinary teams 5-Ability to identify, formulates, and solves engineering problems. Understanding of professional and ethical responsibility. 6-Ability to communicate effectively. 7-The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context 8-Recognition of the need for, and an ability to engage in life-long learning. 9-Knowledge of contemporary issues. 10-Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- Introduction in Water Quality Management and Some Fundamental Concepts (6hrs). 2- Sources of water pollution, Water resources and characterization (9hrs). 3- Water resources and their characterization (6 hrs). 4- Dissolved Oxygen Saturation, Oxygen Sag Curve (6 hrs). 5- Mathematical models of physical systems (6 hrs). 6- Restoration and Management (river), Eutrophication (6hrs). 7- Restoration and Management (6 hrs). 8- WQI (15hrs)

Course Description	Water quality management policies aimed at achieving sustainable use of their water resources by protecting their quality while maintaining economic and social development .Achieving this objective requires that the need and wants of the community for each water resource are defined and that these resources are protected from degradation. These community needs generally are called the environmental values or beneficial uses of the water body and can include water for drinking, swimming, fishing, recreation, agricultural.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
In class lectures	60			
In class tests	3			
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
dorm, home memorizing	32			
Preparticon for tests	30			
Homeworks	25			
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل		150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	all	LO #1, 2, 3, and 4
	Assignments	6	30% (30)	All	LO # 1, 2, 3, 4, 5 and 6
Summative assessment	Midterm Exam	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction in Water Quality Management
Week 2	Some Fundamental Concepts
Week 3	Water resources and their characterization
Week 4	Sources of water pollution
Week 5	Direct effects on water quality
Week 6	Dissolved Oxygen Saturation, Oxygen Sag Curve
Week 7	Contaminates transport processes+ **Midterm Exam**
Week 8	Mathematical models of physical systems
Week 9	Restoration and Management (river)
Week 10	Restoration and Management Eutrophication
Week 11	Development and application of clean technology
Week 12	Protection of aquatic ecosystems
Week 13	Canadian water quality guidelines for protection of aquatic life
Week 14	Canadian water quality guidelines for protection of aquatic life
Week 15	Canadian water quality guidelines for protection of aquatic life
Week 16	**Final Exam**

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. Engineering Management of Water Quality Hardcover – January 1, 1968 by McCaughey, P. H., (Author) 2. Water quality monitoring: a practical guide to the design and implementation of freshwater quality studies and monitoring programs. Bartram, J., & Ballance, R. (Eds.). (1996).	Yes
Recommended Texts	**None**	
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	**ENGINEERING ECONOMICS**	**Module Delivery**
Module Type	**CORE**	**Theory** **Tutorial**
Module Code	**ENVR-ENG-407**	
ECTS Credits	4	
SWL (hr/sem)	100	

Module Level	4	**Semester (s) offered**	2
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Nizar N. Ismaeal	**e-mail**	Dr.nizar1961@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	PhD
Module Tutor	No	**e-mail**	None
Peer Reviewer Name	Dr. Raad Hoobi Irzooqi	**e-mail**	Dr.raad hoobi@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation with Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Engineering Management (ENMG-401)	**Semester**	1
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	1) To provide definition of engineering economic. 2) To provide Knowlagent in kinds of engineering economic. 3) To learn the characteristics of the construction sector. 4) To learn the principles of the engineering economics. 5) To learn the methods of cost accounting in projects. 6) To learn how to be economic manager.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Use both conceptual and numerical techniques to solve engineering problems. 2) Understand the basic information about engineering economic. 3) Understand and use the methods of investment in projects. 4) Understand the interest rate. 5) Make engineering comparisons. 6) Make economic evaluation for projects. 7) Understand and use the breakeven point analysis.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. ● Introduction, principles of management, key words, References. (3 hrs) ● Simple & Compound Interest Rate of Return. (6 hrs) ● Present Worth & Equivalent annual cost calculations (9 hrs) ● Economic evaluation for project, value estimating. (9 hrs) ● Comparisons between alternatives. (9 hrs) ● Depreciation Methods. (6 hrs) ● Decision making. (6 hrs)
Course Description	The course covers the following topics; Characteristics of economic, Simple & Compound Interest Rate of Return, Present Worth & Equivalent annual cost calculation, Pay back method & Present worth method CP Internal Rate Of Return calculations, Economic evaluation for project, value estimating, Comparisons between alternatives, Depreciation Methods, Decision making.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures 45** **In class tests 3**	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing 22** **Preparation for tests 20** **HomeWorks 10**	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (20)	2-12	LO #1-6
	Assignments (HomeWorks)	5	20% (20)	2-14	LO # 1-7
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Principles of Economic studies, References.
Week 2	Simple & Compound Interest Rate of Return.
Week 3	Present Worth & Equivalent annual cost calculations.
Week 4	Present Worth & Equivalent annual cost calculations.
Week 5	Pay back method & Present worth method.
Week 6	Pay back method & Present worth method CP Internal Rate Of Return calculations.
Week 7	**Midterm exam**.
Week 8	Economic evaluation for project, value estimating
Week 9	Economic evaluation for project, value estimating.

Week 10	Comparisons between alternatives
Week 11	Comparisons between alternatives
Week 12	Depreciation Methods
Week 13	Depreciation Methods
Week 14	Invest by postponement
Week 15	Decision making for replace the investment
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Principle of Construction Management & Economic Engineering.	Yes
Recommended Texts	1-Contract / Inspection Hand Book, Division of Engineering, U.S Fish and Service Department of the Interior , August 2004	No
Websites	N/A	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	ENGINEERING MANAGEMENT	**Module Delivery**
Module Type	CORE	
Module Code	ENVR-ENG-403	Lecture
ECTS Credits	4	Tutorial
SWL (hr/sem)	100	

Module Level	4	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Nizar N. Ismaeal	**e-mail**	Dr.nizar1961@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	PhD
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. Raad Hoobi Irzooqi	**e-mail**	Dr.raad hoobi@tu.edu.iq
Review Committee Approval	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, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1) To provide definition of construction sector. 2) To provide Knowlagent in kinds of engineering projects. 3) To learn the characteristics of the construction sector. 4) To learn the characteristics of the construction. 5) To learn the methods of controlling in projects. 6) To learn how to be a successful manager.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1) Use both conceptual and numerical techniques to solve engineering problems. 2) Understand the characteristics of the construction industry. 3) Understand and use the methods of planning in projects. 4) Understand and use the networks in project planning. 5) Make quality assurance in projects. 6) Make quality control. 7) Understand and use the general ideas controlling in projects.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. - Introduction, principles of management, key words, References. (3 hrs) - Time control, Bar-chart schedule. (6 hrs) - Critical path methods CPM (9 hrs) - Time – Cost relationship method. (9 hrs) - Program Evaluation & Review Technique PERT. (9 hrs) - Program Evaluation & Review Technique PERT. (6 hrs) - Cash flow forecasting, cost control in networks. (6 hrs)
Course Description	The course covers the following topics; Characteristics of construction, Project phases, Duties of project manager, Time control, Planning techniques and control, Networks, Critical path methods CPM, Resource leveling technique, Program Evaluation & Review Technique PERT, Precedence method PDM, Line off Balance method LOB, Cash flow forecasting, cost control in networks.

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching **strategy** is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 45 **In class tests** 3	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 22 **Preparation for tests** 20 **HomeWorks** 10	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.46
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time (hr)	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	20% (10)	4, 5, 6,8, 10, 12	LO #3, 4, 6
	Assignments (HomeWorks)	5	20% (10)	continuous	LO # 2, 4, 6, 8, 10, 12 and 13
Summative assessment	**Midterm Exam**	2	10% (10)	8	LO # 1-6
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction, principles of management, key words, References.
Week 2	Characteristics of construction, Project phases, Duties of project manager.
Week 3	Time control, Bar-chart schedule.
Week 4	Planning techniques and control, Networks.
Week 5	Critical path methods CPM.
Week 6	Critical path methods CPM.
Week 7	Time – Cost relationship method.
Week 8	**Midterm exam**
Week 9	Resource leveling technique.

Week 10	Program Evaluation & Review Technique PERT.
Week 11	Precedence method PDM.
Week 12	Line off Balance method LOB.
Week 13	Line off Balance method LOB.
Week 14	Cash flow forecasting, cost control in networks.
Week 15	Cash flow forecasting, cost control in networks.
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Principle Of Construction Management & Economic Engineering .	Yes
Recommended Texts	1-Contract / Inspection Hand Book , Division of Engineering , U.S Fish and Service Department of the Iterior , Augest 2004	No
Websites	N/A	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		

Module Title	ENVIRONMENTAL SUSTAINABILITY	Module Delivery	
Module Type	CORE		
Module Code	ENVR-ENG-411	Lecture	
ECTS Credits	4	Seminar	
SWL (hr/sem)	100		

Module Level		4	Semester (s) offered		2
Min number of students			Max number of students		100
Administering Department		Environmental Engineering	College	Engineering	
Module Leader	Dr.Mohamed Burhan Ali		e-mail	mohamedburhan@tu.edu.iq	
Module Leader's Acad. Title			Module Leader's Qualification		
Module Tutor	None		e-mail	None	
Peer Reviewer Name		Prof. Dr. Waleed M. Sh. Alabdraba	e-mail	walabdraba@tu.edu.iq	
Review Committee Approval		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, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1- Explain the facts and context of a variety of current sustainability-related topics and issues 2- Describe and discuss the impact of humans on biodiversity, ecosystem health and the climate system 3- Demonstrate problem solving by proposing creative, balanced solutions to sustainability challenges 4- Undertake critical thinking on a variety of local/global, short/long term, and small/large case studies, all of which have sustainability issues at their core
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of this course students will be able to: 1- Demonstrate comprehension of the major dimensions and definitions of sustainability 2- Identify the guiding principles of sustainability and how to use those principles to enhance sustainability practices 3- integrate and synthesize the primary dimensions of sustainability and resilience (economy/prosperity, biophysical world/environment, and social/cultural/community) and apply them to modern challenges in sustainability 4- Demonstrate an understanding of how sustainability applies to a wide array of disciplines 5- Exhibit the ability to work in a multidisciplinary group to analyze problems and create sustainable solutions
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. ● Introduction to Sustainability: (6hrs) ● Climate and Global Change (6hrs) ● Biosphere (6hrs) ● Physical Resources: Water, Pollution (6hrs) ● Modern Environmental Management (3hrs) ● Sustainable Energy Systems (12hrs) ● Sustainable Infrastructure (6hrs)
Course Description	This course provides a broad survey of various aspects of sustainability. We will explore topics such as climate change, renewable energy, water, agriculture, waste, green building, socially responsible business, ecosystem valuation, environmental justice, and alternative progress indicators, among others. The course will focus on how to create a sustainable future that

	supports environmental health, social equity, and economic vitality (often referred to as the triple bottom line). We will examine challenges and examples of integrated, creative strategies on local, national and global levels.
Learning and Teaching Strategies استراتيجيات التعلم والتعليم
Strategies	1- Problem-Based Learning: Present students with real-world environmental problems and engage them in collaborative problem-solving activities. 2- Case Studies: Analyze and discuss real-life case studies related to environmental sustainability. 3- Group Work and Collaboration: Teamwork and collaboration among students by assigning group projects and discussions. 4- Reflection and Action: Incorporate reflection exercises that encourage students to think about their personal connection to the environment, their values, and their role in promoting sustainability.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل		48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
In class lectures	30			
Seminar	15			
In class tests	3			
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل		52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.47
Library, dorm, home memorizing	20			
Preparation for tests	15			
HomeWorks	17			
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل		100		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	15% (15)	All	LO #1, 2, 3, and 4
	Assignments	6	15% (15)	All	LO #1, 2, 3, and 4
	Seminar	15	10%(10)	Continues	
Summative assessment	Midterm Exam	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

	Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري
	Material Covered
Week 1	Introduction to Sustainability: Humanity and the Environment
Week 2	Challenges for Sustainability
Week 3	Climate and Global Change
Week 4	Milankovitch Cycles and the Climate of the Quaternary
Week 5	Biosphere: Introduction; Biogeochemical Cycles and the Flow of Energy in the Earth System
Week 6	Biosphere: Biodiversity, Species Loss, and Ecosystem Function
Week 7	**Midterm Exam**
Week 8	Physical Resources: Water, Pollution, and Minerals, Modern Environmental Management
Week 9	Sustainable Energy Systems: Introduction; Environmental Challenges in Energy, CO_2, Air, water and Land Use
Week 10	Energy Sources and Carriers
Week 11	Energy Sources and Carriers
Week 12	Problem Solving, Metrics, and Tools for Sustainability
Week 13	Problem Solving, Metrics, and Tools for Sustainability
Week 14	Sustainability Infrastructure
Week 15	Sustainability Infrastructure
Week 16	**Final Exam**

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	Theis, T., Tomkin, J. (eds). (2015). Sustainability: A Comprehensive Foundation.	Yes
Recommended Texts		
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:	

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

	Ministry of Higher Education and Scientific Research - Iraq Tikrit University College of Engineering Environmental Engineering University	

MODULE DESCRIPTOR
وصف المادة الدراسية

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معلومات المادة الدراسية</td>
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<td>Environmental Engineering</td>
<td>College</td>
<td>Engineering</td>
</tr>
<tr>
<td>Module Leader</td>
<td>Aws S. Noaman</td>
<td>e-mail</td>
<td>Eng.awassalwan@tu.edu.iq</td>
</tr>
<tr>
<td>Module Leader's Acad. Title</td>
<td>Assist. Lecturer</td>
<td>Module Leader's Qualification</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Peer Reviewer Name</td>
<td>Dr. Raad Hoobi Irzooqi</td>
<td>e-mail</td>
<td>Dr.raad hoobi@tu.edu.iq</td>
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<td>Review Committee Approval</td>
<td>01/06/2023</td>
<td>Version Number</td>
<td>1.0</td>
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<tr><td colspan="4" align="center">**Relation With Other Modules**
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>**Prerequisite module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
<tr><td>**Co-requisites module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
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<tr><td colspan="2" align="center">**Module Aims, Learning Outcomes, Indicative Contents and Brief Description**
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر</td></tr>
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<td>**Module Aims**
أهداف المادة الدراسية</td>
<td>

1. Summarize the basic principal and standard methods for working out quantities in estimating.
2. Demonstrate the detailed estimate of buildings and workout rate analysis of the various items of work.
3. Understand the material requirements as per specified norms and standards.
4. Assess the valuation of buildings and provide practical knowledge of standard specifications of items of buildings construction.

</td>
</tr>
<tr>
<td>**Module Learning Outcomes**

مخرجات التعلم للمادة الدراسية</td>
<td>

1. Identify various construction materials and its methods of measurement.
2. Apply the engineering specifications requirements to the related work or materials
3. Calculate the quantities for different items of work
4. Understand the preparation of an Abstract Estimate and detailed estimate of building
5. Determine earth work quantity for culverts and canals.
6. Understand preparation of Notice inviting tender document for bidding, tendering process.
7. Evaluate the valuation of building for different specifications

</td>
</tr>
<tr>
<td>**Indicative Contents**
المحتويات الإرشادية</td>
<td>

1. Introduction to Estimation definitions and types.
2. Introduction to construction materials.
3. Introduction to engineering specifications and its applications.
4. Specific engineering works estimation (earthwork, culverts, and canals)
5. Cost analysis and valuation
6. Tendering process

</td>
</tr>
<tr>
<td>**Course Description**</td>
<td>This course is designed for students to develop their competence and skills in the preparation of building estimating, costing, and tendering, in addition to understand the engineering specifications and how it should be applied to the construction materials and methods of works in the engineering projects</td>
</tr>
<tr><td colspan="2" align="center">**Learning and Teaching Strategies**
استراتيجيات التعلم والتعليم</td></tr>
<tr>
<td>**Strategies**</td>
<td>Lectures should handle the necessary fundamental materials and analytical techniques supported by examples and real site problems in addition to use "flipped classroom" as an active learning technique and conduct site visits to link the theoretical part with real site conditions.</td>
</tr>
</table>

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **30** **Seminar** **15** **In class tests** **3**	48	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing 22** **Prepartion for tests** **20** **Homeworks** **10**	52	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.47
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time (hr)	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	15%(15)	2,4,6,10,12	LO #1-6
	Assignments	6	15%(15)	All	LO # 1-7
	Seminar	15	10%(10)	Continues	
Summative assessment	**Midterm Exam**	2	10%(10)	7	LO # 1-4
	Final Exam	3	50%(50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Estimation and engineering specifications
Week 2	GENERAL ITEMS OF WORK IN BUILDING – Standard units principles of working out quantities for detailed and abstract estimates
Week 3	GENERAL ITEMS OF WORK IN BUILDING – Standard units principles of working out quantities for detailed and abstract estimates
Week 4	Approximate method of estimating.
Week 5	Detailed estimates of buildings
Week 6	Detailed estimates of buildings
Week 7	**Midterm exam**
Week 8	Earthworks estimation

Week 9	Culverts and open canals estimation
Week 10	Rate analysis - Working out data for various items of work over head
Week 11	Rate analysis - Working out data for various items of work over head
Week 12	Cost analysis
Week 13	VALUATION Valuation of buildings, standard specifications for different items of building construction.
Week 14	VALUATION Valuation of buildings, standard specifications for different items of building construction.
Week 15	Tendering process
Week 16	**Final exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	حساب الكميات والمواصفات، م.احمد حسين أبو عودة، سلسلة الهندسة المدنية، الجزء الأول، جامعة البلقاء التطبيقية/كلية الهندسة التكنلوجية، الأردن، الطبعة الأولى، 2008	Yes
Recommended Texts	1. Civil Engineering and Costing, S.P. Mahajan, 624. 1042, M214. **2.** Estimating Building and Construction, 692.5, H816, 73-119. **3.** Civil Engineering Estimating and Costing, V.N. VANZIRANI, S.P. CHANDOLA, first edition, 1982.	yes
Websites		

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

<table>
<tr><td colspan="4" align="center">**Module Information**
معلومات المادة الدراسية</td></tr>
<tr><td>**Module Title**</td><td>GRADUATION PROJECT I</td><td colspan="2">**Module Delivery**</td></tr>
<tr><td>**Module Type**</td><td>CORE</td><td colspan="2" rowspan="4">
Field Visit
Practical
Seminar</td></tr>
<tr><td>**Module Code**</td><td>ENVR-ENG-406</td></tr>
<tr><td>**ECTS Credits**</td><td>6</td></tr>
<tr><td>**SWL (hr/sem)**</td><td>150</td></tr>
<tr><td>**Module Level**</td><td>4</td><td>**Semester (s) offered**</td><td>1</td></tr>
<tr><td>**Min number of students**</td><td>2</td><td>**Max number of students**</td><td>6</td></tr>
<tr><td>**Administering Department**</td><td>Environmental Engineering</td><td>**College**</td><td>Engineering</td></tr>
<tr><td>**Module Leader**</td><td></td><td>**e-mail**</td><td></td></tr>
<tr><td>**Module Leader's Acad. Title**</td><td></td><td>**Module Leader's Qualification**</td><td></td></tr>
<tr><td>**Module Tutor**</td><td>None</td><td>**e-mail**</td><td>None</td></tr>
<tr><td>**Peer Reviewer Name**</td><td></td><td>**e-mail**</td><td></td></tr>
<tr><td>**Review Committee Approval**</td><td>01/06/2023</td><td>**Version Number**</td><td>1.0</td></tr>
</table>

Relation With Other Modules العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	The purpose of the Graduation Project is to assure/ascertain that the students have acquired the skills, knowledge and concepts necessary to perform well when they leave the university. Each student will use educational tools to broaden his/her knowledge about a particular, self-selected topic. Students are also expected to show how proficient they are in solving real world problems with certain constraints for the outcome-based evaluation by the review board. GRAD-402 is the Second part of the project to apply literature survey, data collection finding a research question, and establishing the first prototype of their research project.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Select scientific concepts, engineering techniques and business aspects to effectively solve a problem in the area of expertise. 2. Integrate and exchange scientific concepts, engineering techniques and business aspects to effectively solve a problem in the area of expertise. 3. Develop innovative solutions to problems encountered during the implementation process taking into consideration technical, economic, social and environmental requirements. 4. Enhance various skills including IT, technical report writing, presentation skills, communication and team working. 5. Enhance the ability to work under stress and constraints of quality, time and cost. 6. Assess and evaluate effectively the characteristics and performance of components, processes and systems. 7. Deal with risks associated with the project. 8. Investigate the failure of components, processes and systems. 9. Use computational facilities, techniques, and/or measuring instruments to construct process, experiment, component or system.
Indicative Contents المحتويات الإرشادية	• Select a research problem • Preparing the general framework of the project • formulation of the problem • Define concepts and terminology • Objectives, Importance • Present the research plan • Prepare the theoretical background using the latest sources and references
Course Description	Graduation project leading to BSc. Degree, arranged between a student and the faculty member. The aim of the project must be one of the following: application of new scientific methods for solving different Environmental

| | | problems, modification of Environment-Friendly materials, Wastewater engineering research, and their modeling, analysis and Investigation of new research areas in Environmental engineering fields. Design, develop and present a project based on the knowledge acquired during undergraduate studies. |

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

| Strategies | The learning and teaching **strategy** is designed to: This is a capstone project course that will allow students to (preferably) work on a real world problem. It is typically a team work with up to three (3) Members. The aim is to help students to select related project topics and get the project completed eociently, through guiding them in searching reliable literature, preparing and presenting results, and writing the reports |

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل Project management 45 Seminars 15 Final Presentation 3	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل Library, dorm, home memorizing 45 Preparation for seminar 22 Presentation 20	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Seminars	2	10% (10)	Continuous	LO #1, 2, 3, and 4
	Analysis and Design Document	6	10% (10)	Continuous	LO # 1, 2, 3, 4, 5 and 6
	Work done in the semester	30	20% (20)	Continuous	All
Summative assessment	Oral Presentation	2	10% (10)	15	LO # 5-7
	Final Seminars	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

	Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	

	Material Covered
Week 1	Select a research problem
Week 2	Preparing the general framework of the project: introduction, formulation of the problem (questions - hypotheses)
Week 3	Define concepts and terminology
Week 4	Objectives, Importance
Week 5-6-7	Limits, methodology
Week 8-9	Present the research plan to the supervisor and discuss it.
Week 10-11	Prepare the theoretical background using the latest sources and references
Week 12-13	Previous studies and commentary
Week 14	Submit the graduation project proposal to the supervisor for review and comments
Week 15	**Oral Presentation**
Week 16	**Final Seminar**

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

Ministry of Higher Education and
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Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		

Module Title	INDUSTRIAL WASTE MANAGEMENT	Module Delivery	
Module Type	CORE	Theory Tutorial	
Module Code	ENVR-ENG-408		
ECTS Credits	5		
SWL (hr/sem)	125		

Module Level	4	Semester (s) offered	2
Min number of students	15	Max number of students	100
Administering Department	Environmental Engineering	College	Engineering
Module Leader	Rand R. Ahmed	e-mail	randrafi3@tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	MSc
Module Tutor	None	e-mail	None
Peer Reviewer Name	Assist. Prof. Dr.Salwa H.Ahmed	e-mail	dr.salwahadi@tu.edu.iq
Review Committee Approval	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, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1- Be able to understand the basic Concepts of Industrial waste water discharges into streams. Lakes and oceans and problems. Recirculation of Industrial Wastes. Use of Municipal Waste Water in Industries. Able to understand the Properties of industrial waste water 3- Learn how to find the difference between of industrial waste water and understand the basic of Static Fluids and buoyancy phenomena 4- Be able to be familiar with Phenomena surrounding of industrial waste water and that affect them 5- Learn the principle of Dimensional Analysis and how it is applied in the field of liquids
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	On completion of this course students will be able to: 1-Ability to apply knowledge of mathematics, science, and engineering. 2-Ability to design and conduct experiments, as well as to analyze and interpret data. 3-Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability. 4-Ability to function on multi-disciplinary teams 5-Ability to identify, formulates, and solves engineering problems. Understanding of professional and ethical responsibility. 6-Ability to communicate effectively. 7-The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context 8-Recognition of the need for, and an ability to engage in life-long learning. 9-Knowledge of contemporary issues. 10-Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. ● Sources of pollution WW , General classification of industrial pollution , sampling of industrial WW(13hrs) ● Neutralization , Coagulation , Air flotation (12hrs) ● Treatment process (20hrs) ● industry WW (Source and parameter) (15hrs)
Course Description	Industrial Waste And Waste Management is the study of Quality requirements of boiler and cooling waters, Quality requirements of process water for Textiles, Food processing and Brewery Industries, Boiler and cooling water treatment methods. Basic Theories of Industrial Waste water Management, Volume reduction and Strength reduction. Neutralization, Equalization and proportioning. Joint treatment of industrial wastes,

consequent problems. Industrial waste water discharges into streams. Lakes and oceans and problems. Recirculation of Industrial Wastes. Use of Municipal Waste Water in Industries.

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching **strategy** is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques, and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 60 **In class tests** 3	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Dorm, home memorizing** 32 **Preparation for tests** 15 **Homeworks** 15	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation					
تقييم المادة الدراسية					
		Time (hr)	**Weight (Marks)**	**Week Due**	**Relevant Learning Outcome**
Formative assessment	**Quizzes**	2	20% (20)	all	LO #1-8
	Assignments	6	20% (20)	All	LO # 2-10
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Types and sources of pollution WW , General classification of industrial pollution , sampling of industrial WW
Week 2	Theories of minimizing the effect of industrial WW , Classification of treatment methods
Week 3	Oil separator to remove free oil globules (API)
Week 4	Neutralization , Coagulation , Air flotation
Week 5	Dialysis

Week 6	Elect dialysis (ED) , type of membrane and system design
Week 7	Reverse osmosis , **Midterm Exam**
Week 8	Fouling , Oxidation and reduction
Week 9	Solvent extraction
Week 10	Carbon adsorption
Week 11	Ion exchange design and parameter
Week 12	Food industry WW (Source and parameter)
Week 13	Dairy WW, Sugar WW
Week 14	Chemical industry WW , oil refinery
Week 15	Energy industry , Hydro electrical plant
Week 16	**Final Exam**

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	1. M.N. Rao and Dutta (2009), Waste Water Treatment, Oxford & IBH, New Delhi.	Yes
Recommended Texts	1. Met Calf and Eddy (1979), waste water engineering, Mc Graw hill publications, New Delhi, India. 2. Mark J. Hammer and Mark J. Hammer (Jr) (2008), Water and Waste Water technology, Prentice Hall, New York.	
Websites		

APPENDIX:

GRADING SCHEME				
مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

<table>
<tr><td colspan="5" align="center">**Module Information's**
معلومات المادة الدراسية</td></tr>
<tr><td>**Module Title**</td><td colspan="2">REMOTE SENSING AND GIS</td><td colspan="2">**Module Delivery**</td></tr>
<tr><td>**Module Type**</td><td colspan="2">SUPPLEMENT</td><td colspan="2" rowspan="4">**Theory**
Practical</td></tr>
<tr><td>**Module Code**</td><td colspan="2">ENVR-ENG-410</td></tr>
<tr><td>**ECTS Credits**</td><td colspan="2">5</td></tr>
<tr><td>**SWL (hr/sem)**</td><td colspan="2">125</td></tr>
<tr><td>**Module Level**</td><td>4</td><td>**Semester (s) offered**</td><td colspan="2">2</td></tr>
<tr><td>**Min number of students**</td><td>15</td><td>**Max number of students**</td><td colspan="2">100</td></tr>
<tr><td>**Administering Department**</td><td>Environmental Engineering</td><td>**College**</td><td colspan="2">Engineering</td></tr>
<tr><td>**Module Leader**</td><td>Mohammed Hashim Ameen</td><td>**e-mail**</td><td colspan="2">mohammed.hashim@tu.edu.iq</td></tr>
<tr><td>**Module Leader's Acad. Title**</td><td>Lecture</td><td>**Module Leader's Qualification**</td><td colspan="2">MSc</td></tr>
<tr><td>**Module Tutor**</td><td>None</td><td>**e-mail**</td><td colspan="2">None</td></tr>
<tr><td>**Peer Reviewer Name**</td><td>Assis. Prof. dr. Nadia N. Sabeh</td><td>**e-mail**</td><td colspan="2">eng.nadianazhat@tu.edu.iq</td></tr>
<tr><td>**Review Committee Approval**</td><td>01/06/2023</td><td>**Version Number**</td><td colspan="2">1.0</td></tr>
</table>

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	**Semester**	-
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	The main objectives to be achieved after the completion of this course are summarized below: 1. Introducing the principles and concepts of remote sensing, including the different types of remote sensing systems and their applications. 2. Developing an understanding of the fundamental principles and concepts of GIS, including spatial data models, data capture and data manipulation, spatial analysis, and mapping. 3. Providing an overview of the different types of data used in remote sensing and GIS, including satellite imagery, aerial photographs, and other types of spatial data. 4. Developing the practical skills necessary to use remote sensing and GIS software, including image processing software, GIS software, and data analysis tools. 5. Providing an overview of the various applications of remote sensing and GIS in different fields, including environmental science, urban planning, natural resource management, and disaster management. 6. Developing an understanding of the challenges and limitations associated with remote sensing and GIS, including data quality, data interpretation, and data integration. 7. Providing opportunities for students to apply remote sensing and GIS techniques to real-world problems and case studies, including fieldwork and data collection exercises. 8. Developing critical thinking and problem-solving skills necessary to effectively use remote sensing and GIS in research and practice.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Understand the basic principles of remote sensing, including the electromagnetic spectrum, radiometry, and sensors. 2. Analyze and interpret remotely sensed imagery, including satellite and aerial photographs. 3. Use GIS software to create and manage geospatial data, including vector and raster datasets. 4. Apply GIS tools and techniques to perform spatial analysis and modeling, such as terrain analysis, proximity analysis, and network analysis. 5. Integrate remote sensing and GIS technologies to solve real-world problems, such as environmental monitoring, land use planning, and disaster response. 6. Evaluate the accuracy and uncertainty of remote sensing and GIS data and results. 7. Demonstrate effective communication and teamwork skills by presenting and discussing GIS and remote sensing projects.

	8. Understand the ethical and legal issues related to the acquisition, use, and dissemination of geospatial data.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. basic concepts of remote sensing& GIS (6 hrs) electromagnetic radiation (EMR) spectrum (4 hrs) energy interactions in the atmosphere (4 hrs) energy interactions with earth surface feature(2 hrs) spectral reflectance curves (4 hrs) satellites and orbits (4 hrs) remote sensing and GIS applications in environmental monitoring (2 hrs) remote sensing and GIS applications in watershed management (2 hrs) remote sensing and GIS applications in irrigation management (2 hrs) remote sensing and GIS applications in rain fall-runoff modelling (2 hrs)
Course Description	The Course Covers The Following Topics; Basic Concepts Of Remote Sensing And GIS , Using GIS With Global Positioning System GPS , Electromagnetic Radiation (EMR) Spectrum , Energy Interactions In The Atmosphere , Energy Interactions With Earth Surface Feature , Spectral Reflectance Curves , Satellites And Orbits , Remote Sensing Applications In Environmental Monitoring, Remote Sensing and GIS Applications in Watershed Management, Remote Sensing and GIS Applications In Irrigation Management, Remote Sensing and GIS Applications In Rain Fall-Runoff Modelling

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

Strategies	This course aims to familiarizing you with advanced topics in digital remote sensing and GIS applications, image evaluation, preprocessing, analysis, interpretation, and visualization. Specific topics include, but are not limited to, geometric and radiometric correction, im-age enhancement, image classification, change detection, and accuracy assessment and Basic GIS applications, from creating a geographical database, adding and displaying data, querying, editing, analyzing, working with tables, and presenting data. Finally, preparing the student to be able to apply projects in environmental subjects. The course includes a lecture which are student-centered and thus highly interactive.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 30 **Practical** 30 **In class tests** 3	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 30 **Preparation for tests** 20 **Homeworks** 8 **writing reports** 4	62	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.13
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20% (20)	all	LO #1, 2, 3, and 4
	Assignments	4	20% (20)	All	LO # 1, 2, 3, 4, 5 and 8
Summative assessment	Midterm Exam	2	10% (10)	7	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction, Electromagnetic Energy, Principles of Remote Sensing
Week 2	Passive/ Active Remote Sensing Remote Sensing Platforms, Airborne and Space-borne Remote Sensing,.
Week 3	Ideal Remote Sensing System, Characteristics of Real Remote Sensing Systems, Advantages and Disadvantages of Remote Sensing
Week 4	Electromagnetic energy, Electro-Magnetic Radiation (EMR) spectrum
Week 5	Energy sources and radiation principles, Remote sensing using electromagnetic radiation.
Week 6	Composition of the atmosphere , Energy Interactions, Scattering
Week 7	Absorption , Sensor selection for remote sensing, **Midterm Exam**
Week 8	Energy Interaction, Reflection, Diffuse and Specular Reflection, Spectral Reflectance Curves.
Week 9	Spectral Reflectance Curve for Vegetation, Spectral Reflectance of Soil
Week 10	Spectral Reflectance for Water, Spectral Reflectance of Some Natural Features.
Week 10	Characteristics of satellite orbits , Geosynchronous orbit
Week 11	Polar (or Near Polar) orbits , Sun-synchronous orbits , Remote sensing application
Week 12	Remote Sensing And Gis Applications In Environmental Monitoring
Week 13	Remote Sensing And Gis Applications In Watershed Management
Week 14	Remote Sensing And Gis Applications In Irrigation Management
Week 15	Remote Sensing And Gis Applications In Rain Fall-Runoff Modelling

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي التطبقي

	Material Covered
Week 1	**Introduction to Geographic Information Systems GIS** Definition of GIS, GIS applications, Geospatial data, data for GIS applications, digital representation of geospatial data, Vector representation of data and raster representation of data.
2-3	**ArcCatalog & ArcMap**

		Geodatabases, Catalog tree, Metadata Raster files, Map documents, Globe documents, and layer files. Starting ArcMap, Opening an existing map document, Adding data, Moving around the map, Displaying a layer, Identifying a feature, Adding graphics, and Laying out a map
4-5	**Using GIS with Global Positioning System GPS** Introduction to GPS and Coordinate systems	
6-8	**Editing & Tables in GIS** Editor tool and Working with tables	
9-11	**Symbology and Labelling** Symbolizing Points, Symbolizing Polygons, Categories, Graduated Color, and Labeling Features	
12-13	**Toolbox** Analysis tools, Conversion tools, and Statistics and Modeling.	
14-15	**Layout:** Map layout, and Project	

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	Basic of Remote Sensing and GIS by DR. S-Kumar , ISBN : 9788131805442	NO
Recommended Texts	Textbook of Remote Sensing and Geographical Information Systems 3rd Edition. M.ANJREDDY, 2008 **ISBN-13 :** 978-9385433351	No
Websites	N/A	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required
Note:				

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

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	SIMPLIFIED WASTEWATER TREATMENT SYSTEMS		**Module Delivery**	
Module Type	CORE		Theory Tutorial	
Module Code	ENVR-ENG-404			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	4	**Semester (s) offered**		1
Min number of students	15	**Max number of students**		100
Administering Department	Environmental Engineering	**College**	Engineering	
Module Leader	Dr. Salwa H. Ahmed	**e-mail**	dr.salwahadi@tu.edu.iq	
Module Leader's Acad. Title	Assist Professor	**Module Leader's Qualification**	Ph.D.	
Module Tutor	None	**e-mail**	None	
Peer Reviewer Name	Dr. Salwa H. Ahmed	**e-mail**	dr.salwahadi@tu.edu.iq	
Review Committee Approval	01/06/2023	**Version Number**	1.0	

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	WSWT-301	Semester	1
Co-requisites module	None	Semester	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر

Module Aims أهداف المادة الدراسية	Enable students to develop an understanding of the aerobic and anaerobic biological treatment process to design various simplified wastewater treatment systems based on the process of suspended and attached growth of microorganisms, which vary according to their shapes and design requirements, and to understand the removal mechanism of each system operating either in batches or continuously, under conditions aerobic and anaerobes.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Be able to understand the basic Concepts of Wastewater treatment. 2- Be able to understand wastewater characteristics. 3- Learn how to Design simplified systems. 4 Be able to be familiar with Purposes of wastewater treatment. 5- Be able to understand design wastewater systems. 6- Be able to be familiar with wastewater biological treatment. 7- Able to design an integrated treatment system for a residential city with one of the simplified systems
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. • Fundamentals of wastewater treatment Review (4 hrs) • Design of aerobic biological treatment units suspended growth process (12 hrs) • Design of aerobic biological treatment units: Attached growth processes (16 hrs) • Design of anaerobic biological treatment units: Attached growth processes (12 hrs) • Design of anaerobic Biological Treatment Units Suspended Growth Process (4 hrs) • Secondary Clarification, Methane Gas Production (8 hrs)
Course Description	This course aims to establish basic knowledge of the design and engineering of simplified bioremediation systems. The course presentation begins with introducing the biological engineering algorithm and methods, the design requirements for each method, and then their use in the design of each system. Aerobic and anaerobic treatments with suspended and attached microorganisms were discussed.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **60** **In class tests** **3**	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** **47** **Preparation for tests** **25** **Home works** **15**	87	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation					
تقييم المادة الدراسية					
		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (20)	2,5, 10, 12, 14	LO #1, 2, 3, 4, and 5
	Assignments	15	20% (20)	Continuous	LO # 1, 2, 3, 4, 5,6 and 7
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-6
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Design of Secondary Biological Treatment Units Suspended Growth Process Extended Aeration System.
Week 2	Oxidation Ditch
Week 3	Aerated Lagoon
Week 4	Waste stabilization pond
Week 5	Design of aerobic biological treatment units: Attached growth processes
Week 6	Trickling filters
Week 7	**Midterm exam**
Week 8	Bio Towers
Week 9	RBC units

Week 10	Design of anaerobic biological treatment units: Attached growth processes Packed bed up-flow and down-flow reactors.
Week 11	Extended bed reactor; Fluidized bed reactor
Week 12	Up-flow anaerobic sludge blanket reactor
Week 13	Design of anaerobic biological treatment units: Suspended growth processes
Week 14	Secondary Clarification
Week 15	Methane Gas Production
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	**Available in the Library?**
Required Texts	**"Wastewater treatment concepts and design approach" by G.L. Karia and R.A. Christian, 2013, 2nd edition, Delhi-110092**	Yes
Recommended Texts	**"Fundamentals of wastewater treatment and Engineering" by Rumana Riffat, 2013, by Taylor & Francis Group, LLC CRC Press is an imprint of Taylor & Francis Group, an Informa business.**	No
Websites	-	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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

Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

<table>
<tr><td colspan="3">Module Information
معلومات المادة الدراسية</td></tr>
<tr><td>Module Title</td><td>SLUDGE TREATMENT</td><td>Module Delivery</td></tr>
<tr><td>Module Type</td><td>CORE</td><td rowspan="4">Theory
Tutorial</td></tr>
<tr><td>Module Code</td><td>ENVR-ENG-405</td></tr>
<tr><td>ECTS Credits</td><td>5</td></tr>
<tr><td>SWL (hr/sem)</td><td>125</td></tr>
</table>

Module Level	4	Semester (s) offered	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Dr. Haneen A. Kh. Karaghool	**e-mail**	haneen82@tu.edu.iq
Module Leader's Acad. Title	Assistant Professor	**Module Leader's Qualification**	Ph.D.
Module Tutor	None	**e-mail**	-
Peer Reviewer Name	Dr. Waleed M. Sh. Alabdraba	**e-mail**	walabdraba@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

<table>
<tr><td colspan="4" align="center">**Relation with Other Modules**
العلاقة مع المواد الدراسية الأخرى</td></tr>
<tr><td>**Prerequisite module**</td><td>WSWT-302</td><td>**Semester**</td><td>2</td></tr>
<tr><td>**Co-requisites module**</td><td>None</td><td>**Semester**</td><td>-</td></tr>
<tr><td colspan="4" align="center">**Module Aims, Learning Outcomes, Indicative Contents and Brief Description**
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر</td></tr>
<tr><td>**Module Aims**
أهداف المادة الدراسية</td><td colspan="3">The results of the entire treatment process are significantly influenced by how wastewater sludge is handled (by process controllers). Sludge is the primary output of the wastewater treatment facility, aside from the final effluent. Sludge handling is a significant cost component of wastewater treatment. The primary focus is on sludge. The methods for treating sludge, such as digestion, dewatering, thickening, and drying, are covered in detail. The students learn how to use sludge sustainably and start thinking of it as a resource rather than a waste. After taking the course, students will comprehend how their handling of sludge contributes to the wastewater treatment plant's effective operation.</td></tr>
<tr><td>**Module Learning Outcomes**

مخرجات التعلم للمادة الدراسية</td><td colspan="3">1. Be able to understand the basic concepts of sludge treatment processes.
2. Be able to understand the Properties of generated sludge from different wastewater treatment stages.
3. Identify the basic contaminants of sludge; organic and inorganic
4. Impart the basic concept of sludge conditioning, dewatering, and thickening.
5. Learn the principle of designing the sludge facilities; such as digesters, drying beds, etc.
6. Be able to understand sludge facilities and digesters: aerobic and anaerobic ones.</td></tr>
<tr><td>**Indicative Contents**
المحتويات الإرشادية</td><td colspan="3">Indicative content includes the following:
● Introduction to Sludge (8 hrs.)
● Relationships in Sludge (12 hrs.)
● Basic Contaminants in Sludge (4 hrs.)
● Basic concepts of sludge handling processes (12hrs.)
● Design sludge facilities (14 hrs.)
● Final disposal of sludge (8hrs.)</td></tr>
<tr><td>**Course Description**</td><td colspan="3">Sludge Treatment is the study of processes designed to help wastewater operators understand the basic operations and control of solids and bio-solids produced from wastewater treatment stages. These processes include dewatering, thickening, and digestion of sludge. Also, this subject studies their advantages and disadvantages, and long-term process control. Operators will explore the critical components and microbiology of generated sludge processes, how to develop effective sampling programs and analyze lab results, and how activated sludge processes relate to other wastewater treatment processes. Finally, the final disposal of sludge on land application.</td></tr>
<tr><td colspan="4" align="center">**Learning and Teaching Strategies**
استراتيجيات التعلم والتعليم</td></tr>
<tr><td>**Strategies**</td><td colspan="3">The learning and teaching **strategy** is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques and</td></tr>
</table>

	demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** **60** **In class tests** **3**	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 30 **Preparation for tests** **12** **Homework** **15** **Seminar** **5**	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation
تقييم المادة الدراسية

		Time (hr.)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	4	20% (20)	3, 7, 10, 14	All
	Assignments	15	20% (20)	All	LO # 1, 2, 3, 4, and 5
Summative assessment	**Midterm Exam**	2	10% (10)	9	LO # 1-4
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction in Sludge; definition, importance, and Types
Week 2	characteristics of sludge
Week 3	Relationships in sludge; mass and volume
Week 4	Quantity of generated sludge
Week 5	Basic contaminants of sludge; organic and inorganic
Week 6	Sludge conditioning
Week 7	Sludge thickening
Week 8	Sludge dewatering
Week 9	**Mid-Term Exam**

Week 10	Sludge Digestion
Week 11	Aerobic Digestion of Sludge
Week 12	Anaerobic Digestion of Sludge
Week 13	Sludge Composting
Week 14	Final sludge disposal
Week 15	Landfilling of Sludge
Week 16	**Final Exam**

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	**Available in the Library?**
Required Texts	**Wastewater Engineering: Treatment and Resource Recovery: Treatment and Reuse. Metcalf & Eddy, Inc., 2013.**	Yes
Recommended Texts	**1- "Wastewater Treatment Concepts and Design Approach", Karia G.L., and Christian R.A., 2000** **2- "Fundamentals of Wastewater Treatment and Engineering", Rumana R., 2012.** **3- "Biological Wastewater Treatment Series: Volume 6, Sludge Treatment and disposal", Cleverson V.A., Marcos V.S., and Fernando F., 2007.**	No

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:	

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

MODULE DESCRIPTOR

وصف المادة الدراسية

Module Information	
معلومات المادة الدراسية	

Module Title	WATER AND SANITARY NETWORKS	Module Delivery	
Module Type	CORE	Theory Tutorial	
Module Code	ENVR-ENG-409		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	4	Semester (s) offered	2
Min number of students	15	Max number of students	100
Administering Department	Environmental Engineering	College	Engineering
Module Leader	Dr. Wesam S. Mohammed-Ali	e-mail	wisam.s.mohammed@tu.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	Abbas A. Kanoosh	e-mail	kanoosh.abbasali@tu.edu.iq
Peer Reviewer Name	Dr. Raad H. Irzooki	e-mail	dr.raadhoobi@tu.edu.iq
Review Committee Approval	01/06/2023	Version Number	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	ENHY-302 + FLUD202	**Semester**	2, 2
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	This course is attempted to help satisfy the required need for bringing together the information related to the hydraulic design and analysis of water network, sanitary network, and plumbing system in buildings.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1. Interpret and analyses data related to flow demand and people growth. 2. Apply the fundamental flow theories to analyze water supply pipeline. 3. Formulate the elementary principles of distributing plumbing system in buildings. 4. Understand the strategies for designing sewer system. 5. Understand the strategies for designing water storm system.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. ● Estimating the demand and growth (8 hrs.) ● Analysis of Network flow in pressurized pipes (16) ● Plumbing fixtures distribution in building (10 hrs.) ● Sewer System Design (12 hrs.) ● Water storm network and fitting Design (12)
Course Description	This course aims to establish fundamental knowledge of hydraulic design and engineering of pipeline systems. Students are introduced to standard hydraulic for the design of water network distribution systems for towns and buildings. Also, they will be able to know the details of the water and sewerage network and their accessories, and everything related to the work of pipelines.

Learning and Teaching Strategies	
استراتيجيات التعلم والتعليم	
Strategies	The learning and teaching **strategy** is designed to: Carefully cover in lectures the necessary fundamental material and analytical techniques and demonstrate concepts with appropriate (and where possible practical) examples Allow students adequate time to practice the techniques using a large number of carefully selected tutorial problems.

Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 60 **In class tests** 3	63	**Structured SWL (h/w)** الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 50 **Preparation for tests** 22 **HomeWorks** 15	87	**Unstructured SWL (h/w)** الحمل الدراسي غير المنتظم للطالب أسبوعيا	5.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	20% (20)	2, 4, 7, 10,12,14	LO #1, 2, 3, and 4
	Assignments	10	20% (20)	3, 6, 9, 12	LO # 1, 2, 3, 4, and 5
Summative assessment	Midterm Exam	2	10% (10)	8	LO # 1-3
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	General introduction to water resources and study the water demand
Week 2	Demand prediction and percentage of growth rate
Week 3	Water distribution system, the type of pipes used water supply system
Week 4	Analysis of the water distribution system (Equivalents pipes)
Week 5	Analysis of the water distribution system (Hardy-cross)
Week 6	Plumbing system, fixtures, and hot and cold water in a multistory building
Week 7	Plumbing system, fixtures, and hot and cold water in a multistory building
Week 8	**Midterm Exam** + The source of sewage
Week 9	The type of sewer systems
Week 10	Appurtenances of the sewer system
Week 11	Design of the sewer system
Week 12	The source of storm water and rainfall
Week 13	Design of the storm water pipes system
Week 14	Design of gutters and inlets in storm water system
Week 15	**Review Week before Final Exam**
Week 16	**Final Exam**

<table>
<tr><td colspan="3" align="center">Learning and Teaching Resources
مصادر التعلم والتدريس</td></tr>
<tr><td></td><td align="center">Text</td><td align="center">Available in the Library?</td></tr>
<tr><td>Required Texts</td><td>Water Supply Engineering Design, M. Anis Al-Layla ,S. Ahmad ,E. J. Middlebrooks, Ann A. Publishers,Inc,1977</td><td align="center">Yes</td></tr>
<tr><td>Recommended Texts</td><td>Butler, D., and JW, D. (2011), Urban Drainage, Taylor & Francis.
Geiger, W. F., 2.9, I. H. P. W. G.-.-P. A., and UNESCO (1987), Manual on Drainage in Urbanized Areas: Planning and design of drainage systems, UNESCO.
 Mays, L. W. (2001), Stormwater collection systems design handbook, McGraw-Hill Professional Water and wastewater by Shun Dar Lin, McGraw – Hill, 2nd edition</td><td align="center">No</td></tr>
<tr><td>Websites</td><td></td><td></td></tr>
</table>

APPENDIX:

GRADING SCHEME مخطط الدرجات				
Group	**Grade**	التقدير	**Marks (%)**	**Definition**
Success Group (50 - 100)	**A -** Excellent	امتياز	90 - 100	Outstanding Performance
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	D - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
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Fail Group (0 – 49)	**FX** – Fail	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

Note:

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Ministry of Higher Education and
Scientific Research - Iraq
Tikrit University
College of Engineering
Environmental Engineering Department

MODULE DESCRIPTOR
وصف المادة الدراسية

Module Information		
معلومات المادة الدراسية		
Module Title	**WATER REUSE**	**Module Delivery**
Module Type	**CORE**	**Theory** **Tutorial**
Module Code	**ENVR-ENG-402**	
ECTS Credits	**5**	
SWL (hr/sem)	125	

Module Level	4	**Semester (s) offered**	1
Min number of students	15	**Max number of students**	100
Administering Department	Environmental Engineering	**College**	Engineering
Module Leader	Mohammed Taha Hammood	**e-mail**	m.t.hamud@tu.edu.iq
Module Leader's Acad. Title	Lecturer	**Module Leader's Qualification**	MSc
Module Tutor	None	**e-mail**	None
Peer Reviewer Name	Dr. waleed M.Sh. Alabdraba	**e-mail**	walabdraba@tu.edu.iq
Review Committee Approval	01/06/2023	**Version Number**	1.0

Relation With Other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	WSWT-301	**Semester**	1
Co-requisites module	None	**Semester**	-

Module Aims, Learning Outcomes, Indicative Contents and Brief Description	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية مع وصف مختصر	
Module Aims أهداف المادة الدراسية	1- Provide a definition of terms related to reclaimed water and the applications in which they are used. 2- To explain the concept of risk management in reclaimed water and the guidelines and regulation related thereto. 3- To give information about the types of reclaimed water storage. 4- Explanation of salt balance in cooling towers within the industrial uses of reclaimed water. 5- To provide modern technological information on the efficiency of water reclamation. 6- Explain the concept of biofilms and study their types. 7- Explain the concept of reverse osmosis system and its analysis and design method.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1- Use each of the conceptual techniques for wastewater reclamation. 2- Analysis of risk indicators in the use of reclaimed water using specific mathematical models. 3- Understanding and using the general idea of binding and non-binding instructions for the use of reclaimed water. 4- Understanding and using the general ideas for storing reclaimed water in correct scientific ways. 5- Determine the most common applications using reclaimed water. 6- Understanding and using the most modern techniques in wastewater reclamation. 7- Applying mechanical theories in the water reclamation process, which compensate for the applied physical methods. 8- Understanding and calculating methods of working with modern mechanical techniques in water reclamation.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- Definition & Issues/constraints (8 h) 2- Constituent in Reclaimed water & risk assessment (12 h) 3- guidelines & regulation (6 h) 4- Storage of Reclaimed water (6 h) 5- Industrial water reuse & Stability Indexes (8 h) 6- Water Reclamation technology & Applications (10 h)
Course Description	The course covers the following topics: (basic definitions and the seven main applications for the use of reclaimed water, then studying the determinants of using reclaimed water, then studying the guidelines and basic lines in setting standards for use, then studying the methods of storing water, reclaimed water, and studying the most important basic applications for using reclaimed water, the most important of which are industrial applications and recycling Charging groundwater with reclaimed water. Modern reclamation techniques are being studied, the most important of which are members filtration and reverse osmosis technology.

Learning and Teaching Strategies
استراتيجيات التعلم والتعليم

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

Student Workload (SWL)
الحمل الدراسي للطالب

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل **In class lectures** 60 **In class tests** 3	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل **Library, dorm, home memorizing** 30 **Preparation for tests** 18 **Homeworks** 14	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation
تقييم المادة الدراسية

		Time (hr)	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	**Quizzes**	2	20% (20)	2-12	LO #1-6
	Assignments (Homeworks)	5	20% (20)	2-14	LO # 1-7
Summative assessment	**Midterm Exam**	2	10% (10)	7	LO # 1-5
	Final Exam	3	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)
المنهاج الاسبوعي النظري

	Material Covered
Week 1	Definition of terms used in water reuse
Week 2	Waste water reuse application
Week 3	Issues/constraints for waste water reuse categories
Week 4	Constituent in Reclaimed water
Week 5	Introduction to risk assessment

Week 6	Water reuse guidelines & regulation
Week 7	Storage of Reclaimed water
Week 8	**Midterm Exam**
Week 9	Industrial water reuse
Week 10	Stability Indexes
Week 11	Ground water recharge with Reclaimed water
Week 12	Water Reclamation technology
Week 13	Membrane Filtration
Week 14	Reverse Osmosis System (RO)
Week 15	Reverse Osmosis System (RO), Cont'd
Week 16	**Final Exam**

Learning and Teaching Resources
مصادر التعلم والتدريس

	Text	Available in the Library?
Required Texts	**Wastewater treatment and reuse, Metcalf & Eddy, Fourth Edition, 2014**	Yes
Recommended Texts	**WATER REUSE, Issues, Technologies, and Applications Metcalf & Eddy Part 1 & part2**	No
Websites	N/A	

APPENDIX:

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	مقبول بقرار	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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