

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Drawing by Computer	Module Delivery	
Module Type	Support	<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	ENV126		
ECTS Credits	5.0		
SWL (hr/sem)	125		
Module Level	1		
Administering Department	ENV8	College	ENG4
Module Leader	Mohammed Hisham	e-mail	<a href="mailto:m.h.alkafaf@uomosul.edu.iq">m.h.alkafaf@uomosul.edu.iq</a>
Module Leader's Acad. Title	Asstant Lectures	Module Leader's Qualification	MSC
Module Tutor	Ayad Abdullah	e-mail	<a href="mailto:ayad_engineer@uomosul.edu.iq">ayad_engineer@uomosul.edu.iq</a>
	Yousif hassan		<a href="mailto:engyousif123@uomosul.edu.iq">engyousif123@uomosul.edu.iq</a>
	Abeer Khalil		<a href="mailto:abeer.khalil@uomosul.edu.iq">abeer.khalil@uomosul.edu.iq</a>
Peer Reviewer Name		e-mail	E-mail
Scientific Committee Approval Date	12/06/2023	Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Engineering Drawing	Semester	1
Co-requisites module	None	Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Objectives</b> أهداف المادة الدراسية	This course contains comprehensive training in AutoCAD. It incorporates the features, commands, and techniques for creating, editing, and printing 2D drawings with AutoCAD LT.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p><b>CLO-1:</b> Become familiar with the AutoCAD user interface. (i)</p> <p><b>CLO-2:</b> Understand the fundamental concepts and features of AutoCAD. (i)</p> <p><b>CLO-3:</b> Use the precision drafting tools in AutoCAD to develop accurate technical drawings. (i)</p> <p><b>CLO-4:</b> Present drawings in a detailed and visually impressive manner. (ii)</p>
<b>Indicative Contents</b> المحتويات الإرشادية	<p style="text-align: center;">Indicative content includes the following.</p> <p><u>Part A</u> Getting started with AutoCAD (4 hrs)</p> <p><u>Part B</u> Basic drawing and editing commands (drawing lines, erasing objects, drawing vertical lines, drawing rectangles, drawing circles, undo and redo actions) (8 hrs)</p> <p><u>Part C</u> Create a simple drawing (4 hrs)</p> <p><u>Part D</u> Making changes in your drawing (selecting objects for editing, moving objects, copying rotating objects, scaling objects, mirroring objects) (12 hrs)</p> <p><u>Part E</u> Annotation commands; Hatch , hatch edit , Image draw order (24 hrs)</p> <p><u>Part F</u> Organizing drawing with layers , creating new drawings with templates , layer states (8 hrs)</p>
<b>Strategies</b>	This course has several components that include lectures, classwork, homework and quiz. The course will be taught in English, and all mandatory assignments have to be submitted within the deadlines to be admitted to the exams.

<b>Student Workload (SWL)</b> الحمل الدراسي للطلاب محسوب ل ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	4.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	62	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	5.0
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>125</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	2	20 % (20)	6, 10	All
	<b>Classwork</b>	7	12 % (12)	2, 3, 4, 9,11,12,13	All
	<b>homework</b>	2	8 % (8)	5,8	All
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	7	All
	<b>Exp. exam</b>	1 hr	10 % (10)	15	All
	<b>Final Exam</b>	3hr	40% (40)	16	All
<b>Total assessment</b>			100% (100 Marks)		

<b>Delivery Plan (Weekly Lab. Syllabus)</b> المنهاج الاسبوعي للمختبر	
	Material Covered
<b>Week 1</b>	Getting started with AutoCAD
<b>Week 2 - 5</b>	drawing lines, erasing objects, drawing vertical and horizontal lines, drawing rectangles, drawing circles, undo and redo actions
<b>Week 6</b>	Create a simple drawing
<b>Week 8-13</b>	Annotation commands; Hatch, hatch edit, Image draw order
<b>Week 14-15</b>	Organizing drawing with layers , creating new drawings with templates, layer states

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Autodesk AutoCAD 2018 online Help	Yes
<b>Websites</b>	<a href="https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/">https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/</a>	

## Grading Scheme

### مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
<b>Success Group (50 - 100)</b>	<b>A</b> - Excellent	امتياز	90 - 100	Outstanding Performance
	<b>B</b> - Very Good	جيد جدا	80 - 89	Above average with some errors
	<b>C</b> - Good	جيد	70 - 79	Sound work with notable errors
	<b>D</b> - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	<b>E</b> - Sufficient	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 – 49)</b>	<b>FX</b> – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F</b> – Fail	راسب	(0-44)	Considerable amount of work required

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Fluid mechanics		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	ENV211		
ECTS Credits	8		
SWL (hr/sem)	200		
Module Level	2	Semester of Delivery	
Administering Department	ENV8	College	ENG4
Module Leader	Musab A. Altamir	e-mail	musabaltamir@uomosul.edu.iq
Module Leader's Acad. Title	Assist. Professor	Module Leader's Qualification	M. Sc.
Module Tutor	-----	e-mail	E-mail
Peer Reviewer Name	-----	e-mail	E-mail
Scientific Committee Approval Date	12/06/2023	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>Fluid mechanics deals with the fluid while it is in its static and motion conditions, as the curriculum deals with the basic principles and laws derived on the basis of these principles that govern the fluid in each case. The focus is on the fluid, which is in its liquid state, especially water, as the environmental engineer deals with water in various engineering aspects in the applied field. The application of the laws is clarified through various mathematical examples with their illustrations, after the mathematical formulas for these laws are derived. The curriculum also includes deepening the understanding and assimilation of the theoretical side through practical application by conducting laboratory experiments on a number of the main topics of the subject.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p style="color: red; text-align: center;"><b>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</b></p> <p><b>CLO-1:</b> Defining the formulas that give the main parameters of fluids (i).  <b>CLO-2 :</b> Defining the basic laws that control the behave of fluids in static and dynamics state (i).  <b>CLO-3:</b> Formulate the main equations that cover the fundamentals of concern fields (i).  <b>CLO-4 :</b> Applying the formulas and equations to solve different problems in various fields to give the results that can be used in different sides of engineering (ii).  <b>CLO-5:</b> Applying a certain design procedures for special cases of problems.  <b>CLO-6 :</b> Correlating the theoretical principles with practical by carrying out laboratory experiments with analysis of results and discussion (iii).</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p style="color: red; text-align: center;"><b>Indicative content includes the following.</b></p> <p>1. Theoretical part:</p> <ul style="list-style-type: none"> <li>• Fluids properties, Fluid statics: Pressure in fluid; Types of pressure; Pressure measuring devices.(15 hrs)</li> <li>• Pressure force on submerged plane surface; Pressure force on submerged curved surface. (10 hrs)</li> <li>• Fluid Kinematics: Flow patterns; Continuity equation and its applications. (10 hrs)</li> <li>• Bernoulli's equation and its applications. (10 hrs)</li> <li>• Momentum equation and its applications. (10 hrs)</li> <li>• Flow of real fluid in pipe, friction loss, types of problems, minor losses. (10 hrs)</li> <li>• Pipes in series and parallel. (10 hrs)</li> </ul> <p>2. Laboratory part:</p> <ul style="list-style-type: none"> <li>• Determine the force exerted on submerged plane surface. (2 hrs)</li> <li>• Prove the Bernoulli equation. (2 hrs)</li> <li>• Determine the Reynold number. (2 hrs)</li> <li>• Study flow through orifice in tank. (2 hrs)</li> <li>• Calculate the discharge in pipe using Venturi meter and orifice meter. (2 hrs)</li> <li>• Calculate the discharge through open channel using rectangular and triangle weir. (2 hrs)</li> <li>• Determine the force exerted by water jet on plane and curved surface. (2 hrs)</li> <li>• Determine the friction factor in pipe. (2 hrs)</li> </ul>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	This course has several components that include lectures, individual & group assignments, tutorials. laboratory work to some of the theoretical subjects. The course will be taught in English, and all mandatory assignments have to be submitted within the deadlines to be admitted to the exams.
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## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	<b>108</b>	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	7.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	<b>92</b>	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	6.13
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>200</b>		

## Module Evaluation

### تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	7	13 % (10)	2, 4, 6, 8, 10, 12 and 14	CLO-1, CLO-1, CLO-2, CLO-2, CLO-3, CLO-3, CLO-3
	<b>Assignments</b>	6	15 % (5)	2, 4, 6, 8, 10 and 12	CLO-1, CLO-2, CLO-2, CLO-3, CLO-3, CLO-3
	<b>Report</b>	8	12 % (4)	1, 2, 4, 6, 8, 10, 12, 13	Clo-4
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	12	CLO-1, CLO -2 and CLO-3
	<b>Final Exam</b>	3hr	50% (50)	16	CLO-1, CLO -2 and CLO-3
<b>Total assessment</b>			100% (100 Marks)		

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	Material Covered
Week 1-2	Fluids properties, Fluid statics: Pressure in fluid; Types of pressure; Pressure measuring devices.
Week 3-4	Pressure force on submerged plane surface; Pressure force on submerged curved surface.
Week 4-5	Fluid Kinematics: Flow patterns; Continuity equation and its applications
Week 6-8	Bernoulli's equation and its applications
Week 9-10	Momentum equation and its applications
Week 11-12	Flow of real fluid in pipe, friction loss, types of problems, minor losses
Week 13-15	Pipes in series and parallel
Week 16	Preparatory week before the final Exam

<b>Delivery Plan (Weekly Lab. Syllabus)</b> المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1-2	Determine the force exerted on submerged plane surface
Week 3-4	Prove the Bernoulli equation
Week 5-6	Determine the Reynold number
Week 7-8	Study flow through orifice in tank
Week 9-10	Calculate the discharge in pipe using Venturi meter and orifice meter
Week 10-11	Calculate the discharge through open channel using rectangular and triangle weir
Week 12-13	Determine the force exerted by water jet on plane and curved surface
Week 13-14	Determine the friction factor in pipe

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>Esposito, A., 1998, Fluid Mechanics with applications, Prentice Hall, Inc.</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>Cengel Y. and Cimbala J., 2014, Fluid Mechanics Fundamentals and Applications, 4th edition, McGraw Hill.</li> </ul>	Yes



<b>Websites</b>	<a href="https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/">https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/</a>
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<b>Grading Scheme</b> مخطط الدرجات				
Group	Grade	التقدير	Marks %	Definition
<b>Success Group (50 - 100)</b>	<b>A</b> - Excellent	امتياز	90 - 100	Outstanding Performance
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	<b>C</b> - Good	جيد	70 - 79	Sound work with notable errors
	<b>D</b> - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
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<b>Fail Group (0 - 49)</b>	<b>FX</b> – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F</b> – Fail	راسب	(0-44)	Considerable amount of work required
<p><b>Note:</b> Marks Decimal places above or below 0.5 will be rounded to the higher or lower full mark (for example a mark of 54.5 will be rounded to 55, whereas a mark of 54.4 will be rounded to 54. The University has a policy NOT to condone "near-pass fails" so the only adjustment to marks awarded by the original marker(s) will be the automatic rounding outlined above.</p>				

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Environmental Chemistry	Module Delivery	
Module Type	Core	<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input checked="" type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	ENV212		
ECTS Credits	7		
SWL (hr/sem)	125		
Module Level	2		
Administering Department	ENV8	College	ENG4
Module Leader	Dr. Iman Ghanim	e-mail	<a href="mailto:lmanghanim20@uomosul.edu.ig">lmanghanim20@uomosul.edu.ig</a>
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	-----	e-mail	E-mail
Peer Reviewer Name	-----	e-mail	E-mail
Scientific Committee Approval Date	12/06/2023	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>The aim of this course is to introduce the students to the area of environmental chemistry. The course will cover the chemistry of the air, water and soil and examine the environmental fate of anthropogenic chemicals released into the environment. This course employs the chemical principles to be used to explain and predict reactions, partitioning, and concentrations of anthropogenic chemicals in different environmental compartments. The course also emphasizes the impact of common pollutants on humans, animals, plants and the nonliving parts of the earth. Then, it will consider possible green chemistry, engineering and societal approaches to mitigating deleterious effects of pollution. The course will be beneficial to chemists, chemical and environmental engineers, and environmental scientists.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p style="color: red; text-align: center;"><b>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</b></p> <p><b>CLO-1:</b> Identify and evaluate the relative importance of various reactions, physical processes and</p> <p><b>CLO-2:</b> Demonstrate an understanding of atmospheric chemistry and air pollution</p> <p><b>CLO-3:</b> Solve problems involving the principles of chemical kinetics.</p> <p><b>CLO-4:</b> Describe the greenhouse effect, climate change; and distinguish between fossil fuels and renewable energy technologies.</p> <p><b>CLO-5:</b> Describe chemical reactions and processes responsible for creating the "ozone hole".</p> <p><b>CLO-6:</b> Describe the scientific basis underlying global climate change and the American Chemical Society position and recommendations regarding climate change.</p> <p><b>CLO-7:</b> Calculate equilibrium concentrations of organic pollutants in environmental compartments based on partition coefficients. Assess the advantages and limitations of such calculations.</p> <p><b>CLO-8:</b> Explain basic concepts of water chemistry and water pollution</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p style="color: red; text-align: center;"><b>Indicative content includes the following.</b></p> <p><u>Part A – Atmospheric Chemistry and Air Pollution</u></p> <ul style="list-style-type: none"> <li>• Stratospheric Chemistry: The Ozone Layer • The Ozone Holes • The Chemistry of Ground-Level Air Pollution • The Environmental and Health Consequences of Polluted Air— Outdoors and Indoors</li> </ul> <p><u>Part B – The Greenhouse Effect, Climate Change, Fossil Fuels and CO<sub>2</sub></u></p> <ul style="list-style-type: none"> <li>• The Greenhouse Effect • Energy Use, Fossil Fuels, CO<sub>2</sub> Emissions, and Global Climate Change • Biofuels and Other Alternative Fuels • Renewable Energy</li> </ul>

	<p>Technologies: Hydroelectric, Wind, Solar, Geothermal, and Marine Energy and Their Storage •</p> <p>Part C – Toxic Organic Compounds</p> <p>Toxic Heavy metals • Pesticides • Dioxins, Furans, and PCBs Other Toxic Organic Compounds of Environmental Concern • Wastes, Soils and Sediment</p> <p>Part D – Water chemistry and Water Pollution</p> <p>The Chemistry of Natural Waters • The Pollution and Purification of Water</p>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	<p>This course has several components that include lectures, individual &amp; group assignments, field visits and e-learning platforms. The course will be taught in English, and all mandatory assignments have to be submitted within the deadlines to be admitted to the exams. The basic laboratory work supports lecture topics.</p>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ أسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>125</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	4	16 % (16)	2, 3, ,12 and 14	CLO-1, CLO-2, CLO-3, CLO-5
	<b>Assignments</b>	5	12 % (12)	2, 3, 4, 6, and 10	CLO-2, CLO-2, CLO-3, CLO-2, CLO-3
	<b>Projects / Lab.</b>	6	8% (8)	13	CLO-2 to CLO-6

	<b>Report</b>	1	4 % (4)		All
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	7	CLO-1, CLO -2 and CLO-3
	<b>Final Exam</b>	3hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	<b>Material Covered</b>
<b>Week 1</b>	<b>Introduction to Environmental Chemistry / Syllabus</b> Earth history; Beginnings of life; Atmosphere; Cycles; Air pollution; Ozone; Smog; Greenhouse effect; Water pollution; Water treatment.
<b>Week 2</b>	<b>Water Chemistry</b> Define water chemistry and recognize its importance in environmental systems; Describe water and its main properties; Calculate concentration in different media/systems
<b>Week 3&amp;4</b>	<b>Chemical Kinetics</b> Rate of a chemical reaction; Effect of concentration on reaction rates; Rate law; Zero-order reactions; First-order reactions; Second-order reactions; Theoretical models for chemical kinetics; The effect of temperature on reaction rates; Reaction mechanisms; Catalysis.
<b>Week 5</b>	<b>The Earth's Atmosphere</b> The Atmosphere; Functions of the atmosphere; Layers of the atmosphere; Temperatures and regions; Reactions and calculations in atmospheric chemistry
<b>Week 6</b>	<b>Stratospheric Chemistry – Ozone</b> Concerns about stratospheric ozone; Energy transition; UV absorption and photochemistry; Stratospheric ozone formation; Catalytic decomposition of ozone; Chlorofluorocarbons; The ozone hole; Polar Stratospheric Clouds.
<b>Week 7</b>	<b>Tropospheric Chemistry – Smog</b> Classical smog; Photochemical smog; The photochemistry of smog; Reactions of hydrocarbons in the troposphere; Exhaust gases from engines; Ozone production from engine emissions.
<b>Week 8</b>	<b>Tropospheric Chemistry - Precipitation</b>

	Composition of rain; Atmospheric production of nitric and sulfuric acids; Acidifying agents; Rain, snow and smog chemistry; Control of anthropogenic emissions.
<b>Week 9 &amp; 10</b>	<b>Aerosols and Chemistry of Urban and Indoor Atmospheres</b> Sources and concentrations of aerosols; aerosols lifetime; Air pollution for particulate emissions; Pollutants in urban atmosphere; Indoor quality and common indoor air contaminants
<b>Week 11</b>	<b>The Chemistry of Global Climate</b> Energy balance; Global warming; Greenhouse effect; Sources and sinks of greenhouse gases.
<b>Week 12</b>	<b>Distribution of Species in Aquatic Systems</b> Phosphate species; Cadmium complexes; Chromium in tannery wastes.
<b>Week 13</b>	<b>Gases in Water</b> Henry's law; Oxygen in natural and sea waters; Gases reacting with water; Alkalinity and pH.
<b>Week 14</b>	<b>Metals in the Hydrosphere</b> Toxic metals; Biogeochemical cycle of metal species; Mercury cycle; Mercury, lead and cadmium pollution
<b>Week 15</b>	<b>Nuclear Chemistry</b> Radioactivity, Types of Radioactivity, Effect of Radiation on Life, Radon, and Nuclear Energy
<b>Week 16</b>	<b>Review before the final Exam</b>

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	Lab Safety
<b>Week 2</b>	Calculate PH
<b>Week 3</b>	Water Quality (collect water from fossil site, lake, river, ocean)
<b>Week 4</b>	The Effect of Acid Deposition on Aquatic Ecosystems
<b>Week 5</b>	Distinguish between an acid and a base
<b>Week 6</b>	
<b>Week 7</b>	

### Learning and Teaching Resources

## مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>Gary W. vanLoon and Stephen J. Duffy "Environmental Chemistry: A Global Perspective" 3rd Edition, Oxford University Press, 2010</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>Colin Baird and Michael Cann "Environmental Chemistry" 5th Edition, 2012.</li> <li>Lab Manual: Environmental Laboratory Exercise for Instrumental Analysis and Environmental Chemistry by Dunnivant, ISBN # 9780471488569, Publisher: Wiley</li> </ul>	Yes
<b>Websites</b>		

## Grading Scheme

### مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
<b>Success Group (50 - 100)</b>	<b>A</b> – Excellent	امتياز	90 - 100	Outstanding Performance
	<b>B</b> - Very Good	جيد جدا	80 - 89	Above average with some errors
	<b>C</b> – Good	جيد	70 - 79	Sound work with notable errors
	<b>D</b> - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	<b>E</b> – Sufficient	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 – 49)</b>	<b>FX</b> – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F</b> – Fail	راسب	(0-44)	Considerable amount of work required

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Concrete & Building Technology	Module Delivery	
Module Type	Support	<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	ENV213		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	2		
Administering Department	ENV8	College	ENG4
Module Leader	(1) Dr. Omar M. Abdulkareem (2) Mohammed Hisham Shukur	e-mail	(1) omaralhakeem@uomosul.edu.iq (2) M.h.alkafaf@uomosul.edu.iq
Module Leader's Acad. Title	(1) Lecturer (2) Assitant Lecturer	Module Leader's Qualification	(1) Ph.D. (2) M. Sc.
Module Tutor	-----	e-mail	E-mail
Peer Reviewer Name	-----	e-mail	E-mail
Scientific Committee Approval Date	13/06/2023	Version Number	1.0

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



## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>This course is aimed principally at university and college students who wish understand the concrete for the purpose of using it in professional practice. The students must take sufficient care to ensure the selection of correct ingredients, for concrete making to achieve a suitable mix, and to obtain a technically sound execution of concrete works. They must also have an intimate knowledge of the interaction between the different components that go into making concrete, whether in a fresh state or in a hardened state. This knowledge is necessary for students to be competent engineers in their dealings with the concrete and construction materials that go into their manufacture.</p> <p>Moreover, this course aims to introduce students to the principles of building systems, construction methods and techniques, starting from the idea, feasibility study, preparation of plans, methods of implementation, and excavation. Besides that, the equipment and methods of transporting and compacting of concrete with its determinants, and an explanation of masonry units with their properties and methods of construction with them. The course aims to get students familiarized with structural as well as finish works to be implemented in construction process for the floors, walls, ceilings, with the construction problems &amp; methods of treatment.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p><b>CLO-1:</b> Identify the concrete composition, classification, characteristics, and mix proportioning (i).</p> <p><b>CLO-2:</b> Recognize the constituent materials (cement, water, fine and coarse aggregates, and admixtures) in concrete and evaluate how their engineering properties influence the behaviour and performance of the resulting concrete (i).</p> <p><b>CLO-3:</b> Able to determine the fresh and the hardened properties of the concrete, and understanding concrete performance as a good basics for the building construction and the structural design (ii).</p> <p><b>CLO-4:</b> Practicing laboratory experiments with execution, compilation and analysis on concrete and its ingredients in addition to the other construction materials (iii).</p> <p><b>CLO-5:</b> Identify the concepts and principles associated with the building, and technology of construction and be able to evaluate and interpret them using sketches, drawings or in written form (i).</p> <p><b>CLO-6:</b> Recognize building elements and components in specific situations; how, when and where they would be favoured; and the construction sequence for simple buildings (i).</p> <p><b>CLO-7:</b> Evaluate the appropriateness of different approaches, materials and construction in simple construction in accordance with building and technology theories and standards, in proportion to the requirements for the structural integrity of buildings (i).</p>

## Indicative Contents

### المحتويات الإرشادية

#### 1- Concrete Technology Topics:

##### a- Topics of Theoretical Part:

- Introduction to Concrete: Concrete definition, Concrete composition, Concrete classification, Concrete characteristics, Concrete mix ratios (Conservation of mix weight ratios to volume ratios, Rich and lean concrete mixes) (2 hrs).

- Cement: Cement definition, Manufacture of Portland cement, Chemical composition of Portland cement clinker, Control Ratios, Phase composition of Portland cement clinker, Physical properties of cement (Compressive strength, Setting time, Early stiffening (False set and flash set), Particle size and fineness, Soundness, Consistency, Heat of hydration, Loss on ignition, Density and relative density (Specific gravity), Bulk density), Types of Portland cement (Main types, Blended cements, Special cements) (4 hrs).

- Mixing Water for Concrete: Introduction, Effects of impurities in mixing water on concrete properties (Alkali carbonate and bicarbonate, Chloride, Sulfates, Miscellaneous inorganic salts, Acid waters, Alkaline waters, suspended particles), Organic impurities (Waters carrying sanitary sewage, Sugar, Algae) (2 hrs).

- Aggregates in Concrete: Definition, Characteristics (Particle shape, Surface texture, Bulk density (unit weight) and voids, Relative density (Specific gravity), Absorption and moisture conditions, Alkali-silica reaction (ASR), Sampling, Grading) (4 hrs).

- Chemical Admixtures for Concrete: Definition, Reasons, Classes (Retarding admixtures, Accelerating admixtures, Water-reducing admixtures) (2 hrs).

- Fresh Properties of Concrete: Introduction, Fresh properties (Workability (Factors affecting, Measurement), Segregation, Bleeding, Plastic shrinkage), Composition of fresh concrete (Unit weight (Density), Yield, Cement factor) (6 hrs).

- Hardened Properties of Concrete: Strength (Compressive strength, Factors affecting compressive strength, Tensile strength, Flexure strength, Modulus of elasticity, Poisson's ratio, Shrinkage, Creep) (8 hrs).

##### b- Topics of Experimental Part:

- An exploratory tour of the construction materials testing laboratory to identify the devices and tests available there in, in addition to how to prepare the engineering report for the experiment according to the relevant structure (2 hrs).

- Standard consistency and initial setting time of the cement paste using Vicat apparatus (2 hrs).
  - Compressive strength of the cement mortar cubes and tensile strength of the cement mortar brackets (2 hrs).
  - Sieve analysis of the aggregate (Fine and Coarse) (2 hrs).
  - Specific gravity, unit weight, surface moisture, and absorption capacity of the aggregate (4 hrs).
  - Properties of the fresh concrete (Workability, Proportion of sand, Unit weight) (2 hrs).
  - Capping, Relationship between the compressive strength of cubic specimen and compressive strength of cylindrical specimen (2 hrs).
  - Steel reinforcement test (2 hrs).
  - Masonry units tests (Red clay brick, Concrete block, Terrazzo, and Ceramic tiles) (4 hrs).
  - Non-destructive tests (Rebound hammer, Core test, Ultrasonic pulse velocity test, Load test) (6 hrs).
- 2- Building Technology Topics:**
- General introduction of buildings, Stage of construction buildings, Steps to achieve any engineering project, Development of building construction, Definition and importance of feasibility study (2 hrs).
  - Earth excavations, Cracking rocks, Groundwater drainage, Soil fillings & compaction (4 hrs).
  - Foundation depth, Soil & foundation , Types of foundation, Settlement of foundation (4 hrs).
  - Concrete production: Mixing, Transporting, Placing, Compaction and finishing, Curing, Specifications and precautions (4 hrs).
  - Types of bricks, Manufacture of bricks, Blocks, Types of build in brick & block, Types of binders (2 hrs).
  - Types of molds, Loads on mold, Types of scaffolding, Special types of molds (2 hrs).
  - Lintels, Type of lintels, Columns, Classification of columns (2 hrs).

	<ul style="list-style-type: none"> <li>- Load on floors &amp; slabs, Finishing of floors &amp; slabs (2 hrs).</li> <li>- Moisture damages, Moisture proof materials, Treatment of moisture in old buildings (2 hrs).</li> <li>- Finishing of walls from inside &amp; outside, Paintings, General notes of finishing (2 hrs).</li> <li>- Stairs, types of stairs, Moving stairs, Elevators (2 hrs).</li> </ul>
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<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	This course has several components that include lectures, laboratory and field visits. The course will be taught in English, and all mandatory assignments have to be submitted within the deadlines to be admitted to the exams.

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	93	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	10	30% (30)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, and 12	All
	<b>Assignments</b>	1	2% (2)	3	CLO-6

	<b>Projects / Lab.</b>				
	<b>Report</b>	8	8% (8)		CLO-4
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	7	CLO-1, CLO-2, CLO-5, CLO-6
	<b>Final Exam</b>	3hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

#### المنهاج الاسبوعي النظري

	<b>Material Covered</b>
<b>Week 1</b> Concrete Technology	Introduction to Concrete: Concrete definition, Concrete composition, Concrete classification, Concrete characteristics, Concrete mix ratios (Conservation of mix weight ratios to volume ratios, Rich and lean concrete mixes).
<b>Week 1</b> Building Technology	General introduction of buildings, Stage of construction buildings, Steps to achieve any engineering project, Development of building construction, Definition and importance of feasibility study.
<b>Week 2</b> Concrete Technology	Cement: Cement definition, Manufacture of Portland cement, Chemical composition of Portland cement clinker, Control Ratios, Phase composition of Portland cement clinker, Physical properties of cement (Compressive strength, Setting time, Early stiffening (False set and flash set), Particle size and fineness.
<b>Week 2</b> Building Technology	Earth excavations, Cracking rocks.
<b>Week 3</b> Concrete Technology	Cement: Soundness, Consistency, Heat of hydration, Loss on ignition, Density and relative density (Specific gravity), Bulk density), Types of Portland cement (Main types, Blended cements, Special cements).
<b>Week 3</b> Building Technology	Groundwater drainage, Soil fillings & compaction.
<b>Week 4</b> Concrete Technology	Mixing Water for Concrete: Introduction, Effects of impurities in mixing water on concrete properties (Alkali carbonate and bicarbonate, Chloride, Sulfates, Miscellaneous inorganic salts, Acid waters, Alkaline waters, suspended particles), Organic impurities (Waters carrying sanitary sewage, Sugar, Algae).
<b>Week 4</b> Building Technology	Foundation depth, Soil & foundation.
<b>Week 5</b> Concrete Technology	Aggregates in Concrete: Definition, Characteristics (Particle shape, Surface texture, Bulk density (unit weight) and voids, Relative density (Specific gravity).
<b>Week 5</b> Building Technology	Types of foundation, Settlement of foundation.

<b>Week 6</b> Concrete Technology	Aggregates in Concrete: Absorption and moisture conditions, Alkali-silica reaction (ASR), Sampling, Grading.
<b>Week 6</b> Building Technology	Concrete production: Mixing, Transporting, Placing.
<b>Week 7</b> Concrete Technology	Chemical Admixtures for Concrete: Definition, Reasons, Classes (Retarding admixtures, Accelerating admixtures, Water-reducing admixtures).
<b>Week 7</b> Building Technology	Concrete production: Compaction and finishing, Curing, Specifications and precautions
<b>Week 8</b> Concrete Technology	Fresh Properties of Concrete: Introduction, Fresh properties (Workability (Factors affecting, Measurement).
<b>Week 8</b> Building Technology	Types of bricks, Manufacture of bricks, Blocks, Types of build in brick & block, Types of binders.
<b>Week 9</b> Concrete Technology	Fresh Properties of Concrete: Segregation, Bleeding.
<b>Week 9</b> Building Technology	Types of molds, Loads on mold, Types of scaffolding, Special types of molds.
<b>Week 10</b> Concrete Technology	Fresh Properties of Concrete: Plastic shrinkage, Composition of fresh concrete (Unit weight (Density), Yield, Cement factor).
<b>Week 10</b> Building Technology	Lintels, Type of lintels, Columns, Classification of columns.
<b>Week 11</b> Concrete Technology	Hardened Properties of Concrete: Strength (Compressive strength, Factors affecting compressive strength).
<b>Week 11</b> Building Technology	Load on floors & slabs, Finishing of floors & slabs.
<b>Week 12</b> Concrete Technology	<b>Scientific Visit.</b>
<b>Week 12</b> Building Technology	
<b>Week 13</b> Concrete Technology	Hardened Properties of Concrete: Tensile strength, Flexure strength, Modulus of elasticity, Poisson's ratio.
<b>Week 13</b> Building Technology	Moisture damages, Moisture proof materials, Treatment of moisture in old buildings.
<b>Week 14</b>	Hardened Properties of Concrete: Shrinkage, Creep.

Concrete Technology	
<b>Week 14</b> Building Technology	Finishing of walls from inside & outside, Paintings, General notes of finishing.
<b>Week 15</b> Concrete Technology	Hardened Properties of Concrete: Creep.
<b>Week 15</b> Building Technology	Stairs, types of stairs, Moving stairs, Elevators.
<b>Week 16</b>	<b>Preparatory week before the final Exam.</b>

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	An exploratory tour of the construction materials testing laboratory to identify the devices and tests available there in, in addition to how to prepare the engineering report for the experiment according to the relevant structure.
<b>Week 2</b>	Standard consistency and initial setting time of the cement paste using Vicat apparatus.
<b>Week 3</b>	Compressive strength of the cement mortar cubes and tensile strength of the cement mortar brackets.
<b>Week 4</b>	Sieve analysis of the aggregate (Fine and Coarse).
<b>Week 5</b>	Specific gravity, unit weight, surface moisture, and absorption capacity of the aggregate.
<b>Week 6</b>	
<b>Week 7</b>	Properties of the fresh concrete (Workability, Proportion of sand, Unit weight).
<b>Week 8</b>	Capping, Relationship between the compressive strength of cubic specimen and compressive strength of cylindrical specimen.
<b>Week 9</b>	Steel reinforcement test.
<b>Week 10</b>	Masonry units tests (Red clay brick, Concrete block, Terrazzo, and Ceramic tiles).
<b>Week 11</b>	
<b>Week 12</b>	<b>Scientific Visit.</b>
<b>Week 13</b>	Non-destructive tests (Rebound hammer test).
<b>Week 14</b>	Non-destructive tests (Core test).
<b>Week 15</b>	Non-destructive tests (Ultrasonic pulse velocity test, Load test).

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>S. H. Kosmatka and M. L. Wilson, Design and Control of Concrete Mixtures, Portland Cement Association, Fifteenth Edition Print History, USA, 2011.</li> <li>Z. Sacko and A. Levon, Buildings Construction, University of Baghdad, College of Engineering, Department of Civil Engineering, Iraq, 2007.</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>G. Owens, Fulton's Concrete Technology, Cement &amp; Concrete Institute, Printing and Binding by Intrepid Printers (Pty) LTD, Midrand (South Africa), 2009.</li> </ul>	Yes
<b>Websites</b>	<a href="https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/">https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/</a>	

## Grading Scheme

### مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
<b>Success Group (50 - 100)</b>	<b>A - Excellent</b>	امتياز	90 - 100	Outstanding Performance
	<b>B - Very Good</b>	جيد جدا	80 - 89	Above average with some errors
	<b>C - Good</b>	جيد	70 - 79	Sound work with notable errors
	<b>D - Satisfactory</b>	متوسط	60 - 69	Fair but with major shortcomings
	<b>E - Sufficient</b>	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	<b>FX – Fail</b>	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F – Fail</b>	راسب	(0-44)	Considerable amount of work required

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



# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Strength of materials		Module Delivery
Module Type	Support		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
Module Code	ENV214		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2	Semester of Delivery	
Administering Department	ENV8	College	ENG4
Module Leader	Rana Burhan	e-mail	rn.burha@uomosul.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	MSc.
Module Tutor	-----	e-mail	E-mail
Peer Reviewer Name	-----	e-mail	E-mail
Scientific Committee Approval Date	12/06/2023	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>This course is a study of the effect of external loads on structural elements and the behavior of the elements under these loads. Determination of different types of stresses, strains and the relation between them, calculation of stresses in thin-walled pressure vessels, drawing shear and bending-moment diagrams of beams, calculation of bending and shear stresses in beams, and calculating deflections in beams using double integration method are explained in details. The course aims to expand the student's understanding of the structural elements behavior under different loads- that is essential to design and evaluate any structural member.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p style="text-align: center;">Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <p><b>CLO-1:</b> Explain the different types of stresses, the relation between them and Understanding how to calculate them (i).</p> <p><b>CLO-2:</b> Recognize the relation between stress and strain and explain how to calculate them (i).</p> <p><b>CLO-3:</b> Apply fundamental mechanics to evaluate the suitable structural element dimensions that can be applied without exceeding the stress and strain limits of member (ii).</p> <p><b>CLO-4:</b> Demonstrate an understanding of the assumptions and limitations of the theories used in mechanics of materials to draw the shear and moment diagrams for beams subjected to various loads (i)</p> <p><b>CLO-5:</b> Find the maximum shear value and maximum moment value for beams subjected to various loads (i)</p> <p><b>CLO-6:</b> Apply the theories of mechanics of materials to determine the bending and shear stresses for beams subjected to various loads (i)</p> <p><b>CLO-7:</b> Formulate deflection equations for beams subjected to various loads (i).</p> <p><b>CLO-8:</b> Demonstrate an understanding of theories of deflection to find deflection values for beams subjected to various loads (ii)</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p style="text-align: center;">Indicative content includes the following.</p> <p><u>Part A – Simple Stresses</u> Normal Stress, Shear Stress, Bearing Stress, Thin Walled Cylinders (Pressure Vessels) (16 hrs)</p> <p><u>Part B – Simple Strain</u></p>

	<p>Strain (Simple Strain ,Stress-Strain Diagram, Hooke's Law, Poisson's Ratio, Statically Indeterminate Problems , Thermal Strain) (12 hrs)</p> <p><u>Part C – Shear and Moment in Beams</u> Introduction, Supports and Load, Shear-Moment Equations, Area Method for Drawing Shear and Moment Diagram (12 hrs)</p> <p><u>Part D - Stresses in Beams</u> Stresses in Beams(Shear and Flexural Stresses in Beams) (12 hrs)</p> <p><u>Part F - Beam Deflections</u> Double Integration Method (8 hrs)</p>
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### Learning and Teaching Strategies

#### استراتيجيات التعلم والتعليم

<b>Strategies</b>	This course has several components that include lectures, individual & group assignments, field visits and e-learning platforms. The course will be taught in English, and all mandatory assignments have to be submitted within the deadlines to be admitted to the exams.
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### Student Workload (SWL)

#### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>125</b>		

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	4	24 % (24)	4, 8, ,11 and 13	CLO-1,3, CLO-2,3, CLO-4,5, CLO-6
	Assignments	5	16 % (16)	4, 6, 10, 12, and 14	CLO-1,3, CLO-2,3, CLO-4,5, CLO-6 , CLO-7,8
	Projects / Lab.	0	0% (0)		
	Report	0	0 % (0)		
Summative assessment	Midterm Exam	2hr	10% (10)	14	CLO-1, CLO-2, CLO-3, CLO4, CLO5, CLO-6
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)	
المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Introduction to Strength of Materials
Week 2	Normal Stress
Week 3	Shear Stress, Bearing Stress
Week 4	Thin Walled Cylinders (Pressure Vessels) + quiz
Week 5	Simple Strain , Stress-Strain Diagram, Hooke's Law
Week 6	Statically Indeterminate Problems
Week 7	Statically Indeterminate Problems
Week 8	Shear and Moment in Beams (Introduction, Supports and Load) + quiz
Week 9	Area Method for Drawing Shear and Moment Diagram
Week 10	Area Method for Drawing Shear and Moment Diagram
Week 11	Shear and stress in beams+ quiz
Week 12	Shear Stresses in Beams
Week 13	Flexural Stresses in Beams+ quiz
Week 14	Beam Deflections (Double Integration Method) + term exam

Week 15	Beam Deflections (Double Integration Method)
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	<ul style="list-style-type: none"> <li>F. L. Singer and A. Pytel , Strength of materials , 3ed edition, 1980</li> </ul>	Yes
Recommended Texts	<ul style="list-style-type: none"> <li>Pytel and J. Kiusalaas, Mechanics of materials , 2nd edition ,2012, Library of Congress.</li> <li>K.S. Yadav , Strength of materials, 2nd edition , 2018, ISBN: 978-81-89401-50-4.</li> </ul>	Yes
Websites	<a href="https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/">https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/</a>	

Grading Scheme				
مخطط الدرجات				
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	E - Sufficient	مقبول	50 - 59	Work meets minimum criteria
Fail Group (0 - 49)	FX – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	F – Fail	راسب	(0-44)	Considerable amount of work required

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

## MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
<b>Module Title</b>	تطبيقات التحسس النائي ونظم المعلومات الجغرافية		<b>Module Delivery</b>
<b>Module Type</b>	<b>Support</b>		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar
<b>Module Code</b>	ENV215		
<b>ECTS Credits</b>	4		
<b>SWL (hr/sem)</b>	100		
<b>Module Level</b>	UGx 2	<b>Semester of Delivery</b>	
<b>Administering Department</b>	ENV8	<b>College</b>	ENG4
<b>Module Leader</b>	Sabah H. Ali	<b>e-mail</b>	Sabah196004@uomosul.edu.iq
<b>Module Leader's Acad. Title</b>	Prof.	<b>Module Leader's Qualification</b>	M.Sc.
<b>Module Tutor</b>	----	<b>e-mail</b>	
<b>Peer Reviewer Name</b>	None	<b>e-mail</b>	
<b>Scientific Committee Approval Date</b>	12-06-2023	<b>Version Number</b>	1.0

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

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	<ol style="list-style-type: none"> <li>1. لتقديم لمحة عامة عن المبادئ الفيزيائية للتحسس النائي.</li> <li>2. تعريف الطالب بمعالجة بيانات التحسس النائي وتطوير تطبيقات لإدارة موارد الأرض ومراقبتها</li> <li>3. تنمية مهارات محددة في استخدام برامج التحليل المكاني والتحسس النائي المستخدمة في البحث الجغرافي.</li> <li>4. كيف يمكن تطبيق فهم كل هذه على مجموعة من التطبيقات البيئية.</li> <li>5. كيفية انشاء قاعدة بيانات</li> <li>6. التقييم الالي للمرئيات الفضائية والتحليل المكاني</li> <li>7. انشاء خارطة بيئية لمواقع التلوث وادخال البيانات الوصفية للمعالم الارضية</li> </ol>
Module Learning Outcomes	<p>بنهاية الوحدة، يجب أن يكون الطالب قادرًا على:</p> <p>تعريف وشرح المفاهيم والمصطلحات الأساسية المستخدمة في التحسس النائي.</p>



<p>مخرجات التعلم للمادة الدراسية</p>	<ol style="list-style-type: none"> <li>1. وصف الطيف الكهرومغناطيسي وتقدير بعض الخصائص الفيزيائية الأساسية للإشعاع ومدى ملاءمتها للاستخدام في التحسس النائي.</li> <li>2. ملخصات ومناقشة تفاعلات الإشعاع في أطوال موجات الميكروويف المرئية مع البيئة الأرضية ، ومع الغطاء النباتي والتربة والمياه على وجه الخصوص.</li> <li>3. قائمة ومناقشة الميزات المفيدة للتحسس النائي لدراسة بيئة الأرض.</li> <li>4. تحليل وتفسير البيانات التحسس النائي فضلا عن اشتقاق الخرائط الموضوعية من بيانات التحسس النائي</li> <li>5. تحميل المرئيات الفضائية من مواقع النت</li> <li>6. انشاء قواعد البيانات الرقمية وادخال البيانات الوصفية</li> <li>7. اخراج الخرائط وتثبيت المواقع مكانيا</li> <li>8. التحليل المكاني والاحصائي للبيانات الوصفية</li> </ol>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p>من خلال حضور المحاضرات والجلسات العملية ومن خلال استكمال التقييمات، سنعمل على تطوير سمات الخريجين في التحليل المكاني والتحسس النائي ونظم المعلومات الجغرافية ومحو الأمية والمهارات التحليلية في هذه العلوم.</p>

<p><b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم</p>	
<p><b>Strategies</b></p>	<p>تتمثل الاستراتيجية الرئيسية التي سيتم تبنيها في تقديم هذه الوحدة في تشجيع الطلاب على المشاركة في التدريبات، مع تحسين مهارات التفكير النقدي لديهم وتوسيعها في نفس الوقت. سيتم تحقيق ذلك من خلال الفصول والبرامج التعليمية التفاعلية ومن خلال التفكير في نوع التجارب البسيطة التي تتضمن بعض أنشطة أخذ العينات التي تهم الطلاب.</p>

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	37	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.4
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	100		

<b>Module Evaluation</b> تقييم المادة الدراسية					
<b>Assessment</b>		<b>Time/ Number</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	4	15% (15)	5, 10	LO #1, 2, 3,4,7 and 8
	<b>Assignments</b>	5	10% (10)	2, 12	LO # 4, and 5
	<b>Lab.</b>	3	5% (15)	Continuou s	All
	<b>Report</b>	1	5% (5)	13	-

<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	7	LO # 1-6
	<b>Final Exam</b>	3hr	50% (50)	16	All (1-15)
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

#### المنهاج الأسبوعي النظري

Week	Material Covered
Week 1	مقدمة في التحسس النائي: التاريخ والأساسيات.
Week 2	الطيف الكهرومغناطيسي: الموارد ، القياس الإشعاعي ، الكميات المشعة والطيفية ، الأجسام السوداء.
Week 3	تفاعلات الطاقة: فيزياء التفاعلات ، التفاعلات في الغلاف الجوي (عوامل التأثير ، الآليات ، التأثيرات) ، التفاعلات على سطح الأرض (توازن الطاقة ، أنواع مختلفة من العاكسات). آليات الانعكاس ، النقل ، الامتصاص ، التشتت (رايلي ، مي ، غير انتقائي).
Week 4	المزايا الأساسية لعلوم وتقنيات التحسس النائي ، الحصول على البيانات ، تحليل البيانات ، البيانات المرجعية.
Week 5	الصور الجوية : انواعها ، مزاياها ، عيوبها، العلامات المؤشرة عليها.
Week 6	الحصول على البيانات وتفسيرها: أساسيات تفسير الصور.
Week 7	المستشعرات والمنصات: الأنظمة النشطة والسلبية ، Swath Width ..
Week 8	الدقة المكانية والطيفية والإشعاعية والزمانية. مع امثلة على القمر الصناعي (Landsat)
Week 9	تعريف ومدخل الى نظم المعلومات الجغرافية
Week 10	شرح نوافذ البرنامج وكيفية اضافة المرئيات الفضائية والخرائط الورقية .

Week 11	تعريف الانظمة الجيوديسية وكيفية اجراء الاسقاط الجغرافي
Week 12	انواع الاحداثيات وشرح انظمة الاسقاط الرئيسية
Week 13	اجراء عملية الترقيم واستنباط المعالم المكانية في المرئيات الفضائية بواسطة العناصر الاتجاهية
Week 14	ادخال البيانات الوصفية وعمل الجداول الاستعلام عن البيانات المكانية وقياسات المسافات والمساحات وعمل (Bookmark)
Week 15	طريقة عمل الخارطة النهائية (Layout) واطرافه مقياس الرسم واتجاه الشمال والاحداثيات عليها
Week 16	الامتحان النهائي

Delivery Plan (Weekly Lab. Syllabus)	
المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	المختبر 1: مقدمة عامة لأنواع وأسماء برمجيات الاستشعار عن بعد.
Week 2	المختبر 2: نظرة عامة على مواقع النت وتحميل المرئيات الفضائية
Week 3	المختبر 3: تثبيت برنامج ArcGIS 10.3
Week 4	المختبر 4: تعريف واجهة برنامج ArcGIS 10.6 (نظرة عامة)
Week 5	المختبر 5: نوافذ البرنامج وتطبيقاتها
Week 6	المختبر 6: شرح قوائم الادوات وتطبيقاتها
Week 7	المختبر 7: كيفية معرفة الدقة المكانية والطيفية وعدد الحزم الطيفية للقمر الصناعي (لاندسات 8)
Week 8	المختبر 8: اضافة المرئيات الفضائية الى البرنامج
Week 9	المختبر 9: عمل الاسقاط والارجاع والتمييز بين الاحداثيات الجغرافية والتربيعية
Week 10	المختبر 10: تنفيذ انشاء العناصر الاتجاهية وتثبيت الاحداثيات الجيوديسية

Week 11	المختبر 11: اجراء عملية التقييم للعناصر المتجه على المرئيات الفضائية
Week 12	المختبر 12: تغيير خواص العناصر المتجه بحسب نوع المعلم الارضي في المرئية الفضائية
Week 13	المختبر 13: الدخول الى جدول البيانات الوصفية وادخال الحقول والبيانات
Week 14	المختبر 14: استعلام البيانات الوصفية على المرئية الفضائية
Week 15	المختبر 15: انشاء الخارطة النهائية بكل تفاصيلها الجغرافية

Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Lillesand, Thomas M.; Kiefer, Ralph W.; "Chipman, Jonathan "Remote sensing and image interpretation" 6th ed. John Wiley distributor, 2008	Yes
Recommended Texts	<ul style="list-style-type: none"> <li>● نظم المعلومات الجغرافية المملكة العربية السعودية الادارة العامة لتصميم \وتطوير المناهج</li> <li>● تطبيقات الاستشعار عن بعد في برنامج نظم المعلومات الجغرافية ( خميس فاخر بارود) الجامعة الاسلامية – غزة</li> </ul>	Yes
Websites	<a href="https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/">https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/</a>	

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Water quality Engineering		Module Delivery
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input checked="" type="checkbox"/> Seminar
Module Code	ENV221		
ECTS Credits	4		
SWL (hr/sem)	175		
Module Level	2	Semester of Delivery	
Administering Department	ENV8	College	ENG4
Module Leader	Mayada Hazim Dr. Mohammed S. Shihab	e-mail	<a href="mailto:Mayada.hmah@uomosul.edu.iq">Mayada.hmah@uomosul.edu.iq</a> , <a href="mailto:Shihab77@uomosul.edu.iq">Shihab77@uomosul.edu.iq</a> ,
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	M.Sc.
Module Tutor		e-mail	
Peer Reviewer Name	-----	e-mail	E-mail
Scientific Committee Approval Date	12/06/2023	Version Number	1.0
Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Environmental Chemistry	Semester	3
Co-requisites module	None	Semester	
Module Aims, Learning Outcomes and Indicative Contents			
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية			
Module Objectives أهداف المادة الدراسية	The aim of this course is to introduce the students to basic concepts on Water Quality Engineering. The course will cover water resources, principal sources of water pollution, Water Quality Management (rivers, lakes and ground water) , Water quality criteria and standards, Laws and Regulations, Mechanism of pollutant fate in the environment, Modeling of water quality in natural systems. The Lab part: the main goal of this part is to equip students with the expertise and skills necessary for monitoring water quality and analyzing it		

	<p>quantitatively. Also, it incorporates the chemical concepts necessary for managing water quality and reducing pollution.</p> <p>At the end of the course, students will learn how to analyze different water samples and will acquire the necessary expertise and skills to monitor and analyze water quality. This will be achieved through lectures, laboratories and tutorials.</p>
<p><b>Module Learning Outcomes</b></p> <p>مخرجات التعلم للمادة الدراسية</p>	<p><b>CLO-1:</b> Identify Principal sources of water pollution (i).</p> <p><b>CLO-2:</b> Describe the physical, chemical and biological characteristics of water quality and Water quality standards. (i).</p> <p><b>CLO-3:</b> Apply the principle of mass balance to calculate DO Sag in river (ii).</p> <p><b>CLO-4:</b> Apply the principle of mass balance of water quality modeling in lake (ii)</p> <p><b>CLO-5:</b> Understand the Mechanism of pollutant Fate in the environment and Transport processes of pollutants (ii).</p> <p><b>CLO-6:</b> Understand the modeling of water quality in rivers (i)</p> <p><b>CLO-7:</b> Reporting information related to one of the topics of water quality (iv)</p> <p><b>CLO-8:</b> Perform and carryout proper measurement and tests (iii)</p>
<p><b>Indicative Contents</b></p> <p>المحتويات الإرشادية</p>	<p style="text-align: center;"><b><u>Theoretical lectures</u></b></p> <p><u>Part A – Water resources and Sources of water pollution</u> Surface water and Ground water, Point sources and non-point sources, Common impurities in water (6 hrs).</p> <p><u>Part B – Water quality standards and Regulations</u> Physical, chemical and Biological characteristics; Criteria and standards; Law water Act , Safe drinking water Act , Drinking-water standards(9 hrs)</p> <p><u>Part C - Water quality management in rivers</u> Management of waste loads and assimilative capacity of receiving waters. DO Sag curve, Mass-Balance Approach, DO Sag Equation, Management Strategy (9 hrs).</p> <p><u>Part D - Water quality management in Lakes</u> Thermal Stratification of lakes and turn over, Lake productivity, Eutrophication, Control of phosphorus in lakes; Water quality model in lake(6 hrs).</p> <p><u>Part E- Ground water quality</u> Types of contaminants that can pollute an aquifer, Contaminant Migration in Groundwaters (3 hrs).</p> <p><u>Part F- Mechanism of pollutant Fate in the environment</u> Mathematics of motion; continuity and momentum and Advective diffusion, Transport processes (6 hrs).</p> <p><u>Part G- Modeling of water quality in natural systems</u> Types of water quality models, water quality modelling in riverine systems and Water quality index (6 hrs).</p> <p style="text-align: center;"><b><u>Practical labs</u></b></p> <p><u>Part A-</u> Introduction, sampling and River, lake and industrial waste samples collection(4 hrs).</p> <p><u>Part B-</u> Physical tests</p>



	Total Solid, Dissolved Solid, Suspended Solid, PH-meter, Electrical Conductivity, Turbidity , (12 hrs) Part C- Chemical tests Hardness, Ca <sup>+2</sup> and Mg <sup>+2</sup> , Sulphates, Chlorides, Alkalinity, Chemical Oxygen Demand (COD), Dissolved Oxygen (DO), Biochemical oxygen Demand (BOD), Nitrate and Phosphate(14 hrs).		
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم			
<b>Strategies</b>	The course will be achieved through lectures, labs, individual & group assignments, e-learning platforms and tutorials. The course will be taught in English, and all mandatory assignments have to be submitted within the deadlines to be admitted to the exams.		
<b>Student Workload (SWL)</b> الحمل الدراسي للطلاب محسوب ل ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	78	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	5.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	97	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	6.5
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>175</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		<b>Time/Number</b>	<b>Weight (Marks)</b>	<b>Week Due</b>	<b>Relevant Learning Outcome</b>
<b>Formative assessment</b>	<b>Quizzes</b>	4	16 % (15)	2, 4, ,8 and 10	CLO-1, CLO-2, CLO-3, CLO-4
	<b>Assignments</b>	5	12% (10)	4, 8, 10,13 and 14	CLO-2, CLO-3, CLO-4, CLO-5 and CLO-6
	<b>Lab.</b>	8	8 % (8)	13	CLO-8
	<b>Report</b>	1	4 % (4)		All
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	10	CLO-1, CLO -2 and CLO-3
	<b>Final Exam</b>	3hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		
<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري					

	<b>Material Covered</b>
<b>Week 1</b>	Water resources: Introduction, Surface water (rivers, lakes, reservoirs, streams) Ground water (wells, springs).
<b>Week 2</b>	Sources of water pollution: Point sources and non-point sources, Common impurities in water.
<b>Week 3</b>	Physical, chemical and Biological characteristics, Criteria and standards.
<b>Week 4</b>	Irrigation water quality of Criteria and standards, Radioactivity in water.
<b>Week 5</b>	Law and Regulation, clean water Act, Safe drinking water Act, Drinking-water standards.
<b>Week 6</b>	Management of waste loads and assimilative capacity of receiving waters. Effects of pollutant in rivers, Total maximum daily loads (TMDL), Effects of Oxygen –Demanding waste on rivers.
<b>Week 7</b>	Biochemical oxygen-demand, Chemical oxygen demand (COD), Laboratory measurement of biochemical oxygen demand, Addition notes on Biochemical Oxygen Demand, Nitrogen oxidation.
<b>Week 8</b>	DO Sag curve, Mass-Balance Approach, DO Sag Equation, Management Strategy, Nitrogenous BOD, Effect of Nutrients on water quality in rivers.
<b>Week 9</b>	Thermal Stratification of lakes and turn over, Biological zones, Lake productivity, Eutrophication, Algal growth requirement, Control of phosphorus in lakes.
<b>Week 10</b>	Water quality model in lake.
<b>Week 11</b>	Ground water, Types of contaminants that can pollute an aquifer, Darcy equation, Contaminant Migration in Groundwaters.
<b>Week 12</b>	Mechanism of pollutant Fate in the environment: Mathematics of motion; continuity and momentum and Advective diffusion.
<b>Week 13</b>	Transport processes, Initial mixing, Turbulent Diffusion, Longitudinal Dispersion waste.
<b>Week 14</b>	Modeling of water quality in natural systems: Types of water quality models, An elementary water quality model, water quality modelling in river systems.
<b>Week 15</b>	Water Quality Index, indices of pollution, Formulas use in Determination water quality index; classification of water quality index standard.
<b>Week 16</b>	<b>Preparatory week before the final Exam</b>
<b>Delivery Plan (Weekly Lab. Syllabus)</b> المنهاج الاسبوعي للمختبر	
	<b>Material Covered</b>
<b>Week 1</b>	Lab 1: Introduction, sampling.
<b>Week 2</b>	Lab 2: River, lake and industrial waste samples collection
<b>Week 3</b>	Lab 3: Total Solid.
<b>Week 4</b>	Lab 4: Dissolved Solid, Suspended Solid.
<b>Week 5</b>	Lab 5: PH-meter, Electrical Conductivity

<b>Week 6</b>	Lab 6: Turbidity.
<b>Week 7</b>	Lab 7: Hardness, Ca <sup>2+</sup> , and Mg <sup>2+</sup>
<b>Week 8</b>	Lab 8: Sulphates
<b>Week 9</b>	Lab 9: Chlorides.
<b>Week 10</b>	Lab 10: Alkalinity
<b>Week 11</b>	Lab 11: Chemical Oxygen Demand (COD)
<b>Week 12</b>	Lab 12: Dissolved Oxygen (DO).
<b>Week 13</b>	Lab 13: Biochemical oxygen Demand (BOD).
<b>Week 14</b>	Lab 14: Nitrate.
<b>Week 15</b>	Lab 15: Phosphate.

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>Mackenzie L. Davis and Susan J.Masten "Principles of Environmental Engineering and Science", McGraw hill, USA, 3th,2004</li> <li>APHA, AWWA, WPCF "Standard method for the examination of water and wastewater", 1985.</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>David A. Chin "Water quality engineering in natural system", John Wiley &amp; Sons, Inc.,2006.</li> <li>عباوي، سعاد عبد وحسن، محمد سليمان "الهندسة العملية للبيئة - فحوصات الماء" دار ابن الاثير للطباعة للنشر - جامعة الموصل, 1990</li> </ul>	Yes
<b>Websites</b>	<a href="https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/">https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/</a>	

### Grading Scheme

#### مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
<b>Success Group (50 - 100)</b>	<b>A</b> - Excellent	امتياز	90 - 100	Outstanding Performance
	<b>B</b> - Very Good	جيد جدا	80 - 89	Above average with some errors
	<b>C</b> - Good	جيد	70 - 79	Sound work with notable errors
	<b>D</b> - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	<b>E</b> - Sufficient	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 – 49)</b>	<b>FX</b> – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F</b> – Fail	راسب	(0-44)	Considerable amount of work required

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Engineering Surveying	Module Delivery	
Module Type	Supported	<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	ENV222		
ECTS Credits	6		
SWL (hr/sem)	90		
Module Level	2		
Administering Department	ENV8	College	ENG4
Module Leader	Dr. Mohammed	e-mail	mohammed1979eng@uomosul.edu.iq
Module Leader's Acad. Title	Assist. Professor	Module Leader's Qualification	Ph.D.
Module Tutor	-----	e-mail	E-mail
Peer Reviewer Name	-----	e-mail	E-mail
Scientific Committee Approval Date	12/06/2023	Version Number	1.0

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

<b>Module Aims, Learning Outcomes and Indicative Contents</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
<b>Module Objectives</b> أهداف المادة الدراسية	This course aims to introduce the students to the category of Engineering surveying. Introductory and definitions, which are used in plane surveying: Instruments for measuring distance obstacles in measurements Instruments for setting out right angles, Tape corrections. Leveling, Areas, and volumes. Computation of volumes. The Theodolite and Traverse surveying. Tachometry. Curves. Total instrument station, GPS field procedure. This will be achieved through descriptive lectures.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <p><b>CLO-1:</b> The students will be able to define and distinguish the fundamentals of measuring. (i)</p> <p><b>CLO-2:</b> after taking analysis and synthesis design processes, the student can make a primary design of some issues of roads (ii)</p> <p><b>CLO-3:</b> The student will be able to conduct some tests and measurements of surveying, like elevations and coordinates using different devices. (iii)</p> <p><b>CLO-4:</b> The students will be able to make suitable judgments in engineering situations of surveying problems like road construction. (v)</p> <p><b>CLO-5:</b> Report the data obtained from the selective topics of surveying topics given and organized during the course (iv)</p> <p><b>CLO-6:</b> Creating some opinions about the emerging environmental issues and trying to give some solutions compatible with the problems related to surveying aspects (vii)</p>
<b>Indicative Contents</b> المحتويات الإرشادية	<p style="text-align: center;">Indicative content includes the following.</p> <p><u>Part A Introduction</u> Basic Definitions, Types of Surveying, Units, and conversions Linear measurements, tape measurements, and corrections (9 hrs)</p> <p><u>Part B – Leveling</u> Leveling definitions and instruments, Leveling methods, Longitudinal and cross-sections, Contouring (21hrs)</p> <p><u>Part C – Theodolites</u> Theodolites, Angles, bearings, coordinates (9 hrs)</p> <p><u>Part D – Surveying topics</u> Total Station Surveying, GPS principles, Vertical Curves (6 hrs)</p>

<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	This course has several components that include lectures, individual or group assignments, rock lab visits, and e-learning platforms. The course will be taught in Arabic and English, and all mandatory reports have to be submitted within the deadlines.

<b>Student Workload (SWL)</b> الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	93	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	6.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	3.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>150</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	4	20 % (20)	3, 6, 9 and 12	CLO-1, CLO-1, CLO-2, CLO-4
	<b>Assignments</b>	7	10%(10)		All
	<b>Projects / Lab.</b>				
	<b>Report</b>	10	10 % (10)		All
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	7	CLO-1, CLO -2 and CLO-3
	<b>Final Exam</b>	3hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	Material Covered
<b>Week 1</b>	Basic Definitions, Types of Surveying, Units, and conversions
<b>Week 2</b>	Linear measurements
<b>Week 3</b>	tape measurements
<b>Week 4</b>	corrections
<b>Week 5</b>	Leveling definitions and instruments
<b>Week 6</b>	Leveling methods
<b>Week 7</b>	Longitudinal and cross-sections

<b>Week 8</b>	Contouring
<b>Week 9</b>	Contouring
<b>Week 10</b>	Theodolites
<b>Week 11</b>	Angles, bearings
<b>Week 12</b>	coordinates
<b>Week 13</b>	Total Station Surveying
<b>Week 14</b>	GPS principles
<b>Week 15</b>	Vertical Curves
<b>Week 16</b>	<b>The preparatory week before the Final Exam</b>

<b>Delivery Plan (Weekly Lab. Syllabus)</b> المنهاج الاسبوعي للمختبر	
	<b>Material Covered</b>
<b>Week 1</b>	Area measurement by tape and guiding
<b>Week 2</b>	Construct right angles in different ways
<b>Week 3</b>	Projecting a building using a tape measure
<b>Week 4</b>	Projecting a building using the polygon method
<b>Week 5</b>	Leveling device installation
<b>Week 6</b>	Leveling the ground using a leveling device
<b>Week 7</b>	Leveling the ground using a leveling device
<b>Week 8</b>	Longitudinal section and cross-section
<b>Week 9</b>	Longitudinal section and cross-section
<b>Week 10</b>	Theodolite device installation
<b>Week 11</b>	Projecting a building using a Theodolite device
<b>Week 12</b>	Projecting a building using a Theodolite device
<b>Week 13</b>	Total station device installation
<b>Week 14</b>	Use the quick functions in the Total Station device
<b>Week 15</b>	Use the quick functions in the Total Station device

<b>Learning and Teaching Resources</b> مصادر التعلم والتدريس		
	<b>Text</b>	<b>Available in the Library?</b>

<b>Required Texts</b>	B. Kavannagh. "Surveying with Construction Applications", 6th edition	yes
<b>Recommended Texts</b>	Courses from internet	Yes
<b>Websites</b>	<a href="https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/">https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/</a>	

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



# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Hydraulics Applications		Module Delivery	
Module Type	Core		<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	ENV223			
ECTS Credits	4			
SWL (hr/sem)	100			
Module Level	2	Semester of Delivery		4
Administering Department	ENV8	College	ENG4	
Module Leader	Mohammed Salim Mahmood	e-mail	Mohammedsalim@uomosul.edu.iq	
Module Leader's Acad. Title	Assist. Lecturer	Module Leader's Qualification	M.Sc.	
Module Tutor	-----	e-mail	E-mail	
Peer Reviewer Name	-----	e-mail	E-mail	
Scientific Committee Approval Date	12/06/2023	Version Number	1.0	
Relation with other Modules				
العلاقة مع المواد الدراسية الأخرى				
Prerequisite module	Fluids Mechanics		Semester	3
Co-requisites module	None		Semester	

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Objectives</b> أهداف المادة الدراسية	The aim of this course is to introduce the students to the applications of hydraulics in environmental engineering. The course will cover the Open channel flow, non-uniform flow in open channels, Flow measurement and hydraulic control points, Pressure Surges "Water Hammer", and hydraulic similarity. At the end of the course the students will be able to use the hydraulic principles to solve problems associated with environmental engineering and design of unit processes for water and wastewater treatment plants
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p><b>CLO-1:</b> Recognize the common hydraulic Applications encountered in environmental engineering (i)</p> <p><b>CLO-2:</b> Apply knowledge of hydraulics and fluid mechanics to the analysis and design of hydraulic facilities (ii)</p> <p><b>CLO-3:</b> Distinguish between open channels and closed channels. (i)</p> <p><b>CLO-4:</b> Define Specific energy, Critical depth, Determination of critical depth for rectangular channel. (i).</p> <p><b>CLO-5:</b> Solve engineering problems related to Hydraulic gradient and total energy lines, Energy of flowing liquid in open channel, Specific energy of a channel's cross-section. (i)</p> <p><b>CLO-6:</b> Formulate equations to calculate time for emptying tank through orifice (i)</p>
<b>Indicative Contents</b> المحتويات الإرشادية	<p><u>Part A – Open channel flow and Non-uniform flow in open channels</u>                  Open channels flow classifications, Development of uniform flow and its formulas (Chezy and -Manning formulas), Velocity distribution over cross-section of an open channel. (15 hrs)</p> <p><u>Part B – Classification of surface profiles and Flow measurement and hydraulic control points</u>, Direct step method gradually varied flow, Sharp crested weirs, orifices, time for emptying tank through orifices, flow between two vessels. (15 hrs)</p> <p><u>Part C – Pressure Surges "Water Hammer" and Multiport diffuser outfalls</u>                  Propagation of disturbances in fluids, Gradual closure and Instantaneous closure of valves on elastic and rigid pipes, Calculation of water hammer, Damping devices. (15 hrs)</p> <p><u>Part D- hydraulic similarity</u>                  (15 hrs)</p>
<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	This course has several components that include lectures, individual & e-learning platforms. The course will be taught in English, and all mandatory assignments have to be submitted within the deadlines to be admitted to the exams.
<b>Student Workload (SWL)</b>	

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	61	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4.1
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	39	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	2.6
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>100</b>		

**Module Evaluation**

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	5	25 % (25)	3,5,8,12 and 13	CLO-3, CLO-1, CLO-2, CLO-4, CLO-6
	<b>Assignments</b>	3	15 % (15)	2, 6, and 10	CLO-2, CLO-3, CLO-4, CLO-5, CLO-6
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	8	All
	<b>Final Exam</b>	3hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

**Delivery Plan (Weekly Syllabus)**

المنهاج الاسبوعي النظري

	Material Covered
<b>Week 1</b>	Open channel flow
<b>Week 2</b>	Development of uniform flow and its formulas (Chazy's and -Manning formulas). & Velocity distribution over cross-section of an open channel
<b>Week 3</b>	Non-uniform flow in open channels
<b>Week 4</b>	Hydraulic gradient and total energy lines, Energy of flowing liquid in open channel, Specific energy of a channel's cross-section.
<b>Week 5</b>	Specific energy curve, Critical depth, Determination of critical depth for rectangular channel.
<b>Week 6</b>	Froude number, Classification of slopes.
<b>Week 7</b>	Classification of surface profiles in gradually varied flow, Direct step method.
<b>Week 8</b>	Flow measurement and hydraulic control points, Sharp crested weirs, Orifices
<b>Week 9</b>	Time for emptying tank through orifice
<b>Week 10</b>	Pressure Surges "Water Hammer", Propagation of disturbances in fluids,
<b>Week 11</b>	Calculation of water hammer, Damping devices
<b>Week 12</b>	Multiport diffuser outfalls, Types of outfalls, Hydraulics of multiport diffusers.

<b>Week 13</b>	Example of multiport diffusers pipe calculation
<b>Week 14</b>	Hydraulic Similitude and models, Types of Similarity
<b>Week 15</b>	Dimensional Analysis, Buckingham Theorem
<b>Week 16</b>	<b>Preparatory week before the final Exam</b>

### Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	Andrew Chadwick, John Morfett and Martin Borthwick "Hydraulics in Civil and Environmental Engineering", Taylor & Francis Group, 2013	Yes
<b>Recommended Texts</b>	Larry D. Benfield "Treatment Plant Hydraulics for Environmental Engineers", Prentice Hall, New Jersey, 1984.	Yes
<b>Websites</b>	<a href="https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/">https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/</a>	

### Grading Scheme

مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
<b>Success Group (50 - 100)</b>	<b>A</b> - Excellent	امتياز	90 - 100	Outstanding Performance
	<b>B</b> - Very Good	جيد جدا	80 - 89	Above average with some errors
	<b>C</b> - Good	جيد	70 - 79	Sound work with notable errors
	<b>D</b> - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	<b>E</b> - Sufficient	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 – 49)</b>	<b>FX</b> – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F</b> – Fail	راسب	(0-44)	Considerable amount of work required

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Engineering Hydrology	Module Delivery	
Module Type	Support	<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	ENV224		
ECTS Credits	3		
SWL (hr/sem)	75		
Module Level	2		
Administering Department	ENV8	College	ENG4
Module Leader	Dr.Saleh Mohammed Saleh Zakaria	e-mail	s.zakaria@uomosul.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	-----	e-mail	E-mail
Peer Reviewer Name	-----	e-mail	E-mail
Scientific Committee Approval Date	12/06/2023	Version Number	1.0

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

<b>Module Aims, Learning Outcomes and Indicative Contents</b> أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
<b>Module Objectives</b> أهداف المادة الدراسية	The aim of this course is to introduce the students to the area of hydrological processes and practices including introduction to the Hydrology. The course will cover discussion of the basic physical principles of the water cycle, different climate factors and components (evaporation, condensation, precipitation, runoff, stream flow). At the end of the course the students will have a working knowledge for estimating Precipitation in different methods as well as Abstraction from Precipitation, Stream flow Measurement, Run-Off, Hydrograph, and Flood Routing and have the skills of analytical skills (analyze data collected in the field and examine the results) and Communication skills (prepare detailed reports that document their research methods and findings). This will be achieved through descriptive lectures with Preparing hydrological reporting and supervised tutorials.
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <p><b>CLO-1:</b> Recognize the water issues and natural phenomena of different hydrologic process (i)</p> <p><b>CLO-2:</b> Apply the basic engineering concepts to solve issues associated with hydrologic process (i)</p> <p><b>CLO-3:</b> Organizing the needed solution, tabulation and calculation for the hydrological problems(i)</p> <p><b>CLO-4:</b> Deriving standard hydrological relationship Using several methods (i).</p> <p><b>CLO-5:</b> Report the data obtained from the site visits that will be organized during the course (iv)</p> <p><b>CLO-6:</b> Manage risk and uncertainty for flood measurement (vii)</p>
<b>Indicative Contents</b> المحتويات الإرشادية	<p>Indicative content includes the following.</p> <p><b><u>Part A – Introduction and Climate Factors</u></b> An introduction to the Hydrology.Climate Factors, Precipitation, Abstraction from Precipitation (27 hrs)</p> <p><b><u>Part B – Measurements</u></b> Stream flow Measurement, Run-Off, (9 hrs)</p> <p><b><u>Part C – hydrologic details</u></b> Hydrograph, Flood Routing (9 hrs)</p>

<b>Learning and Teaching Strategies</b> استراتيجيات التعلم والتعليم	
<b>Strategies</b>	This course has several components that include lectures, individual & group assignments, field visits and e-learning platforms. Exercises involving the use of computer applications tools to understand the hydrologic processes. The course will be taught in English in addition to the Arabic, and all mandatory

	assignments have to be submitted within the deadlines to be admitted to the exams.
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<b>Student Workload (SWL)</b> الحمل الدراسي للطلاب محسوب ل ١٥ اسبوعا			
<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	48	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	3.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	27	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	1.8
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>75</b>		

<b>Module Evaluation</b> تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	3	12 % (12)	6, 11,14	CLO-1, -2, -6
	<b>Assignments</b>	4	12 % (12)	3, 9, 12, 14	CLO-2, -3, -4,-5
	<b>Projects / Lab.</b>	-----	-----	-----	-----
	<b>Report</b>	2	16 % (16)	7,12	CLO-1, -2,-3,-4
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	10	CLO-1,CLO -2, CLO-3 ,CLO-4
	<b>Final Exam</b>	3hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

<b>Delivery Plan (Weekly Syllabus)</b> المنهاج الاسبوعي النظري	
	Material Covered
<b>Week 1</b>	Introduction, objectives, definition of hydrology, branch of Hydrology, hydrological cycle, Hydrological Budge Equation • Engineering Hydrology Application, Typical Failure Factors for Hydraulic Installations, Source of Data.
<b>Week 2</b>	Climate Factors, Temperature, Solar Radiation, Evaporation, Humidity, Vapor Pressure, Wind.
<b>Week 3</b>	Precipitation , Forms of Precipitation, Measurement of precipitation, Types of rain gauge

<b>Week 4</b>	Errors in rainfall measurement, Precipitation Gage Network, adequacy of rain measurement stations, Preperation of data, Methods for calculating missing information, Test for Consistency of Records.
<b>Week 5</b>	Average Precipitation over Area, Accumulated Rainfall, Hyetograph, Rainfall Intensity, Probable Maximum Precipitation, Point Rainfall, Depth- area- duration –Relationship, Depth-Area-Duration, Intensity –Duration –Return period relation.
<b>Week 6</b>	Abstraction from Precipitation, Losses from precipitation, Evaporation, Evaporimeter, Types of evaporation meters, Class A Evaporation Pan, Pan Coefficien.
<b>Week 7</b>	Evaporation Measurement Stations, Empirical Evaporation Equations, Analytical methods for estimating evaporation, Types of evaporation meters, reducing evaporation from tanks
<b>Week 8</b>	Evapotranspiration, Potential Evapotranspiration, vapotranspiration Equations, Penman Equation, Blaney – Criddle formula, Evapotranspiration Equations
<b>Week 9</b>	Infiltration, Measurement of Infiltration, Infiltration Capacity, Infiltration Capacity Values, Infiltration Indices.
<b>Week 10</b>	Stream flow measurement, Water stage, time curve-Stage , Stream measurement, Measurement of velocity, Calibration, Equalization of the current meter device, steps for measuring discharge by speed- area method.
<b>Week 11</b>	chemical methods for measuring discharge, indirect method and classified into two types: 1- Flow measurement facilities 2- Slope- Area method, calibration curve in case of unsteady flow.
<b>Week 12</b>	Run – off, Factors affecting the volume of runoff, Direct Runoff, Base Flow, annual runoff volume, Empirical Equation, Rational method, Unit hydrograph, CN-SCS method, Flow-Duration Curve, Flow– Mass Curve, Calculation of Maintainable Demand
<b>Week 13</b>	Hydrograph, Surface Runoff, Inter Flow, Base Flow, Hydrograph component, Factors affecting flood hydrograph, Direct Runoff.
<b>Week 14</b>	Base Flow, Base Flow Separation, Effective Rain, Unit Hydrograph, Unit Hydrograph Assumptions, Unit Hydrograph Derivation, Unit Hydrograph for Different Duration, S - Curve Method , Uses and limitations of standard hydrograph.
<b>Week 15</b>	Flood Routing, Hydrologic Storage Routing, Hydrologic Channel Routing.
<b>Week 16</b>	<b>Preparatory week before the final Exam</b>

### Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر



	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	K. Subramana, "ENGINEERING HYDROLOGY", Second Edition Mc Graw hill, New Delhi, 1997	Yes
Recommended Texts	Linsely, R.K., M.A.Kohlerand Paulhus. "HYDROLOGY OF ENGINEERING", McGraw-Hill, Singapore, 1988	Yes
Websites	<a href="https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/">https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/</a>	

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Engineering and Numerical Analysis	Module Delivery	
Module Type	Support	<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input type="checkbox"/> Lab <input checked="" type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	ENV225		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2		
Administering Department	ENV8	College	ENG4
Module Leader	Dr.Salim Yousif Awad	e-mail	sua@uomosul.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	-----	e-mail	E-mail
Peer Reviewer Name	-----	e-mail	E-mail
Scientific Committee Approval Date	12/06/2023	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<p><b>Module Objectives</b> أهداف المادة الدراسية</p>	<p>Differential equations have wide applications in various engineering and science disciplines. In general, modeling variations of a physical quantity, such as temperature, pressure, displacement, velocity, stress, strain, or concentration of a pollutant, with the change of time <math>t</math> or location, such as the coordinates <math>(x, y, z)</math>, or both would require differential equations. Similarly, studying the variation of a physical quantity on other physical quantities would lead to differential equations.</p> <p>It is important for engineers to be able to model physical problems using mathematical equations, and then solve these equations so that the concerned can be studied.</p>
<p><b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية</p>	<p><b>CLO-1:</b> Recognize the common types of differential equation, classification of differential equation and method of solving them (i)</p> <p><b>CLO-2:</b> Apply the basic concepts of sciences and engineering to solve nonlinear equation of single variable, solving system of linear Algebraic equations associated with the engineering problems (i)</p> <p><b>CLO-3:</b> Formulate and modeling of engineering problems in terms of differential equations (ii)</p>
<p><b>Indicative Contents</b> المحتويات الإرشادية</p>	<p style="text-align: center;">Indicative content includes the following.</p> <p>Part A – ordinary differential equations (32 hrs)</p> <ol style="list-style-type: none"> <li>1-Introduction.</li> <li>2- First Order Ordinary Differential Equations.</li> <li>3- Applications on First Order Ordinary Differential Equations.</li> <li>4- Second and Higher Order Ordinary Differential Equations.</li> <li>5- Applications on Second and Higher Order Ordinary Differential Equations.</li> <li>6- Simultaneous Linear Ordinary Differential Equations.</li> </ol> <p>Part B – partial differential equations (PDEs) (12 hrs)</p> <ol style="list-style-type: none"> <li>1-Introduction.</li> <li>2-classification of PDEs</li> <li>3- Method of Separation of Variables</li> <li>4-Laplace Equation (steady state in two dimensional domain)</li> <li>5-Heat equation(Transient condition)</li> </ol> <p>Part C – Numerical methods (16 hrs)</p> <p>Solving nonlinear equation with one variable unknown using Newton-Raphson's method, solution of system of linear Algebraic equations by matrices, Gauss elimination , Gauss-Seidel iteration methods, Interpolation and curve fitting, Numerical integration and differentiation i.e. finite differences method.</p>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	This course has several components that include lectures, individual & group assignments, and e-learning platforms. Exercises involving the use of computer applications tools to understand specific unit processes. The course will be taught in English.
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## Student Workload (SWL)

### الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطالب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطالب أسبوعيا	4.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطالب أسبوعيا	4.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطالب خلال الفصل	<b>125</b>		

## Module Evaluation

### تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	4	40 % (40)	1, 5, ,12 and 14	CLO-1, CLO-1, CLO-2, CLO-2
	<b>Assignments</b>				
	<b>Projects / Lab.</b>				
	<b>Report</b>				
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	8	CLO-1, CLO -2 and CLO-3
	<b>Final Exam</b>	3hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

## Delivery Plan (Weekly Syllabus)

### المنهاج الاسبوعي النظري

	Material Covered
Week 1	Introduction, Definition of differential equations, Classification of differential equations, Origin of differential equations, and Solution of differential equations.
Week 2	First Order Ordinary Differential Equation.
Week 3	First Order Ordinary Differential Equation continued.
Week 4	Applications on First Order Ordinary Differential Equations.
Week 5	Applications on First Order Ordinary Differential Equations continued.
Week 6	Second and Higher Order Ordinary Differential Equations.
Week 7	Applications Second and Higher Order Ordinary Differential Equations continued.
Week 8	Simultaneous Linear Ordinary Differential Equations.
Week 9	Partial Differential Equations.
Week 10	Laplace equation
Week 11	Heat equation
Week 12	Numerical Analysis, solving of nonlinear equation with one unknown
Week 13	Solving of linear Algebraic equations
Week 14	Interpolation and curve fitting
Week 15	Numerical integration and differentiation
Week 16	Preparatory week before the final Exam

## Delivery Plan (Weekly Lab. Syllabus)

### المنهاج الاسبوعي للمختبر

	Material Covered
Week 1	
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	

## Learning and Teaching Resources

### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	ERWIN KREYSZIG "Advanced Engineering Mathematics", JOHN WILEY & SONS, INC., 2011	Yes
<b>Recommended Texts</b>	Wei-Chau Xie "Differential Equations For Engineers" , CAMBRIDGE UNIVERSITY PRESS, 2010	Yes
<b>Websites</b>	<a href="https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/">https://uomosul.edu.iq/en/engineering/environmental-engineering-dept/</a>	

## Grading Scheme

### مخطط الدرجات

Group	Grade	التقدير	Marks %	Definition
<b>Success Group (50 - 100)</b>	<b>A</b> - Excellent	امتياز	90 - 100	Outstanding Performance
	<b>B</b> - Very Good	جيد جدا	80 - 89	Above average with some errors
	<b>C</b> - Good	جيد	70 - 79	Sound work with notable errors
	<b>D</b> - Satisfactory	متوسط	60 - 69	Fair but with major shortcomings
	<b>E</b> - Sufficient	مقبول	50 - 59	Work meets minimum criteria
<b>Fail Group (0 - 49)</b>	<b>FX</b> – Fail	راسب (قيد المعالجة)	(45-49)	More work required but credit awarded
	<b>F</b> – Fail	راسب	(0-44)	Considerable amount of work required

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

# MODULE DESCRIPTION FORM

## نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Microbiology	Module Delivery	
Module Type	Support	<input checked="" type="checkbox"/> Theory <input type="checkbox"/> Lecture <input checked="" type="checkbox"/> Lab <input type="checkbox"/> Tutorial <input type="checkbox"/> Practical <input type="checkbox"/> Seminar	
Module Code	ENV226		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	2		
Administering Department	ENV8	College	ENG4
Module Leader	Dr. Abdullah I. Ibrahim	e-mail	<a href="mailto:abdullah.ibrahim@uomosul.edu.iq">abdullah.ibrahim@uomosul.edu.iq</a>
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	-----	e-mail	E-mail
Peer Reviewer Name	-----	e-mail	E-mail
Scientific Committee Approval Date	12/06/2023	Version Number	1.0

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

## Module Aims, Learning Outcomes and Indicative Contents

### أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

<b>Module Objectives</b> أهداف المادة الدراسية	In Environmental Microbiology, initially students will learn how to deal with different types of microorganisms and it's useful in designing wastewater and water treatment plant. Upon successful completion of this course the student shall be able to:
<b>Module Learning Outcomes</b> مخرجات التعلم للمادة الدراسية	<p>Important: Write at least 6 Learning Outcomes, better to be equal to the number of study weeks.</p> <p>CLO-1: How classify the microorganism.          CLO-2: The structure of microorganism.          CLO-3: Bacterial Morphologies.          CLO-4: Identification of microorganisms and their activities.          CLO-5: How to disinfect drinking water from pathogens.          CLO-6: How to induce water pollution by pathogens.          CLO-7: How waste water is treated biologically using microorganisms.          CLO-8: Factors affecting on microorganisms.          CLO-9: Learning everything regarding microorganisms that may be need them in other environmental engineering subjects in next stages.          CLO-10: How to use the microscope.          CLO-11: How to test the pollution indicators in water.          CLO-12: How to test E. Coli in water samples.          CLO-13: Gram staining procedure.</p>
<b>Indicative Contents</b> المحتويات الإرشادية	<p style="text-align: center;"><b>Indicative content includes the following.</b></p> <p>Part A: Introduction to Microbiology as a science          Microorganisms as cells          Microorganisms and their natural environments          Impact of microorganisms on humans          A brief history of microbiology and recent advances.</p> <p>Part B: The scope of microbial diversity is enormous and microorganisms have exploited every means of making a living consistent with the laws of chemistry and physics          Part C: The “Central Dogma” relates how biological information flows through a cell by a series of macromolecules that are governed by chemical actions.          Part D: Microbial ecology – study of the interaction of microorganisms with each other and their environment</p>

## Learning and Teaching Strategies

### استراتيجيات التعلم والتعليم

<b>Strategies</b>	To enhance the understanding of microbial function in engineering system, initially students must be learned how to deal with different types of microorganisms and it's useful in designing wastewater and water treatment plant. Also microorganisms play an important role in the protection of humans, animals, plants, air, soil, and engineering
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systems from chemical or biological pollution, deterioration, and corrosion, and in the restoration polluted and degraded environments.

### Student Workload (SWL)

الحمل الدراسي للطلاب محسوب لـ ١٥ أسبوعا

<b>Structured SWL (h/sem)</b> الحمل الدراسي المنتظم للطلاب خلال الفصل	63	<b>Structured SWL (h/w)</b> الحمل الدراسي المنتظم للطلاب أسبوعيا	4.2
<b>Unstructured SWL (h/sem)</b> الحمل الدراسي غير المنتظم للطلاب خلال الفصل	62	<b>Unstructured SWL (h/w)</b> الحمل الدراسي غير المنتظم للطلاب أسبوعيا	4.1
<b>Total SWL (h/sem)</b> الحمل الدراسي الكلي للطلاب خلال الفصل	<b>125</b>		

### Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
<b>Formative assessment</b>	<b>Quizzes</b>	4	16 % (16)	2, 3, ,12 and 14	CLO-1, CLO-2, CLO-3, CLO-5
	<b>Assignments</b>	5	12 % (12)	2, 3, 4, 6, and 10	CLO-2, CLO-2, CLO-3, CLO-2, CLO-3
	<b>Projects / Lab.</b>	6	8% (8)	13	CLO-2 to CLO-6
	<b>Report</b>	1	4 % (4)		All
<b>Summative assessment</b>	<b>Midterm Exam</b>	2hr	10% (10)	7	CLO-1, CLO -2 and CLO-3
	<b>Final Exam</b>	3hr	50% (50)	16	All
<b>Total assessment</b>			100% (100 Marks)		

### Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

Material Covered	
<b>Week 1&amp;2</b>	<b>Introduction to Microbiology</b> Why we are concerning for studying Environmental Microbiology, and Germ theory.

<b>Week 3</b>	<b>Classification the microorganisms</b> Studying different types of classifications of microorganisms and Bacterial morphologies.
<b>Week 4&amp;5</b>	<b>Bacterial cell chemistry</b> Studying microorganisms cell structure and cell chemistry.
<b>Week 6&amp;7</b>	<b>Bacterial growth in batch system and continuous flow system</b> Expecting the number of generated bacteria and effect of reactor type on it, also substrate and other components effects on the microorganism's activities, as well as mass balance.
<b>Week 8</b>	<b>Microorganisms in water and bacterial content</b> The types of pathogens and its indicators, standards specifications of drinking water.
<b>Week 9</b>	<b>Detection of evidence of water contamination</b> Coliform and fecal bacteria, viruses.
<b>Week 10&amp;11</b>	<b>Use the microscope and prepare the slides for examination</b> Laboratory lectures for practical testing.
<b>Week 12</b>	<b>Most probability number test for coiform bacteria</b> The most important test for environmental engineers for pollution indicators
<b>Week 13&amp;14</b>	<b>Biological treatment</b> Role of microorganisms in biological treatment of wastewater and the factors that effect on microorganisms activities in wastewater.
<b>Week 15</b>	<b>Review before the final Exam</b>

### Delivery Plan (Weekly Lab. Syllabus)

#### المنهاج الاسبوعي للمختبر

	Material Covered
<b>Week 1</b>	Lab Safety
<b>Week 2</b>	Microscopes
<b>Week 3</b>	Bacteria morphology
<b>Week 4</b>	Total number of bacteria
<b>Week 5</b>	Detection of coliform bacteria

### Learning and Teaching Resources

#### مصادر التعلم والتدريس

	Text	Available in the Library?
<b>Required Texts</b>	<ul style="list-style-type: none"> <li>Environmental Microbiology for Engineers' by Volodymyr Ivanov.</li> </ul>	Yes
<b>Recommended Texts</b>	<ul style="list-style-type: none"> <li>Environmental microbiology-Academic Press (2014), by Ian L Pepper, Charles P Gerba and Terry J Gentry</li> <li>Principles of Environmental Engineering and Science, Mackenzie L. Davis and Susan J. Masten.</li> </ul>	Yes

<b>Websites</b>		

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