



"COURSE PORTFOLIO"

Module Information					
معلومات المادة الدراسية					
Module Title	Open channel Hydraulics I			Module Delivery	
Module Type	Core			☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	QWRE3728				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level		3	Semester		
Department		Water Resources Engineering	College	College of Engineering	
Module Leader	Mohammed Hamid Rasool		E-mail	m.h.rasool@wrec.uoqasim.edu.iq	
Module Leader's Acad. Title		Assist Professor	Module Leader's Qualification		MSc.
Module Tutor	Mohammed Hamid Rasool		e-mail	m.h.rasool @wrec.uoqasim.edu.iq	
Peer Reviewer Name		N.A.	e-mail	N.A.	
Scientific Committee Approval Date		16/10/2023	Version Number	1.0	

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures) + Unstructured SWL (h/w) .

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	82	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		



Relation with other Modules: -

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	QWRE2 622
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

COURSE DESCRIPTION:	The course covers topics related to open channel hydraulics normally covered at the level beyond the undergraduate level in water resources engineering and civil engineering. The focus is on advanced topics for open channel flow including basic concepts of the energy and momentum principles, flow resistance in uniform and non uniform channels, flow in compound channels, natural channels, transitions, unsteady flows and flood routing. Application of the basic principles using the commonly used models are also studied.
Module Aims أهداف المادة الدراسية	The purpose of this course is to introduce the basic concepts and principles of fluid mechanics and hydraulics. Then, to apply this knowledge to the investigation, analysis, design and review of civil engineering infrastructure relating to management of the water cycle and environmental protection in open channels. Whilst following this module, students will acquire the confidence to be able to select appropriate techniques of analysing open channel flow and apply them to realistic engineering problems. Students will also acquire practical experience through several laboratory experiments which reinforce the theoretical fundamentals taught in lectures.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the completion of the course, students are expected to be able to: 1. Quantify the impact of the hydrological cycle on the evaluation and design of civil engineering infrastructure related to urban and rural catchment problems. 2. Recognise the classification of open channel flow and understand the development and application of flow resistance equations for the uniform flow case. 3. Apply the principles of energy and momentum to solve a range of open channel flow problems. 4. Evaluate gradually varied flow profiles in open channels using both theoretical perspectives and quantitative assessment. 5. Develop and appraise design approaches applicable to a selected range of hydraulic structures.

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Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Sturm, Terry, 2001, Open Channel Hydraulics, McGraw-Hill 2. Chow, V.T., 1959, Open Channel Hydraulics, McGraw Hill 3. Henderson, F.M., 1966, Open Channel Flow, MacMillan. 4. French, R.H., 1985, Open Channel Hydraulics
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COURSE SCHEDULE:-

Week	hours	Topics Covered	Learning Outcomes
Topic I			
1	4	<i>Definition and differences between pipe flow and open channel flow</i>	1
Topic II			
2	4	<i>Types of flow</i>	1
Topic III			
3	4	<i>Properties of open channels</i>	1, 2
Topic IV			
4	4	<i>Fundamental equations; Conservation of matter; Conservation of energy</i>	2, 3
Topic V			
5	4	<i>Conservation of momentum</i>	3, 4
Topic VI			
6	4	<i>The momentum equation (momentum principle)</i>	5
Topic VII			

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7	4	Momentum equation for steady flow	6
Topic VIII			
8	4	The Continuity Equation (conservation of mass)	7
Topic IX			
9	4	The Energy equation (conservation of energy)	8
Topic X			
10	4	Velocity distribution in open channels	9
Topic XI			
11	4	Determination of energy and momentum coefficients	10
Topic XII			
12	4	<i>Laminar and Turbulent flow</i>	11
Topic XIII			
13	4	<i>Uniform flow and the Development of Friction formulae</i>	12, 13, 14, 15
Topic XIV			
14	4	The Chezy equation	12, 13, 14, 15
Topic XV			
15	4	The Manning equation	15, 16
Final Exam			

Learning Outcomes and Assessment Methods

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Topics Covered	Learning Outcomes	ABET Outcomes	Assessment Methods
<i>Topic I</i>	1	b, d, e, f, k	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic II</i>	1	b, c, d, e, k	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic III</i>	1, 2	a, b, c, e, h	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic IV</i>	2, 3	a, b, c, e	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic V</i>	3, 4	a, b, c, e, h	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic VI</i>	5	a, b, c, e	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic VII</i>	6	a, b, c, e, g, h, i	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic VIII</i>	7	a, b, c, e, g, h, i, k	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic IX</i>	8	a, b, e, g, i, k	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic X</i>	9	a, b, e, h, i, k	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic XI</i>	10	a, b, c, g, h, i, k	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic XII</i>	11	a, b, c, e, h, i, k	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic XIII</i>	12, 13, 14, 15	a, b, c, e, g, h, i, k	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic XIV</i>	12, 13, 14, 15	a, b, c, e, g, h, i, k	quizzes, discussions during lectures, Written Exams, oral exams.

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<i>Topic XV</i>	15, 16	a, b, c, e, g, i, k	quizzes, discussions during lectures, Written Exams, oral exams.
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Module Evaluation:-

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment (40%)	Quizzes	4	20% (20)	٣,٧, 10	ALL
	Lab. Report	5	10% (10)	٣,٧, 10	ALL
	Assignments & H.W.	4	5% (5)	2,6,9,12	ALL
	Discussions During Lectures	5	5% (5)	Continuous	ALL
Summative assessment (60%)	Midterm Exam (10%)	2hr	10% (10)	12	ALL
	Final Exam (50%)	3hr	50% (50)	16	ALL
Total assessment			100% (100 Marks)		

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توزيع الساعات المجدولة و الغير مجدولة (SWL= SSWL +USWL)

Activity types	Structured SWL	Un structured USWL	No. of weeks	Time Factor	SWL (hr)
Class	Class Lecturers		15		
Lab.					
Tutorial			15		
Self Study		Self Study	15		
Quizzes		Preparation for the Quizzes	3		
discussions during lectures			5		
Projects / Lab.	Project Work		0		
		Preparation for the Project	0		
Seminar	Presenting a Seminar		0		
		Preparation for the Project			
Assignments, Homework		Preparation for the H.W.	6		
Report		Preparation for the Report	0		
Midterm Exam (10%)		Preparation for the Exam.	1		
	Evaluation		1		
Final Exam (50%)		Preparation for the Exam.	1		
	Evaluation		1		
		Total SWL (hr/ Semester)			
		ECTS			9



"COURSE PORTFOLIO"

Module Information					
معلومات المادة الدراسية					
Module Title	THEORY OF STRUCTURES			Module Delivery	
Module Type	Support			☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	QWRE 3629				
ECTS Credits	6				
SWL (hr/sem)	150				
Module Level			3		
Department			Water Resources Engineering	College	College of Engineering
Module Leader		Mustafa Kareem Hamzah		E-mail	Mustafa.kareem@wrec.uoqasim.edu.iq
Module Leader's Acad. Title			Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor		Mustafa Kareem Hamzah		e-mail	Mustafa.kareem@wrec.uoqasim.edu.iq
Peer Reviewer Name			N.A.	e-mail	N.A.
Scientific Committee Approval Date			01/06/2023	Version Number	1.0

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures) + Unstructured SWL (h/w) .

Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	57	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		



Relation with other Modules:-

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	Engineering Mechanics and Strength of materials	Semester	1,2, 4
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
COURSE DESCRIPTION:	The current course defines the structural analysis of different structural members. Describes the functions of structure, design loads, reactions and force systems. analysis of statically determinate structures including beams, trusses, and frames. Introducing the suitable method of finding deflections of structures; influence lines and criteria for moving loads; analysis of statically indeterminate structures including continuous beams and frames.
Module Aims أهداف المادة الدراسية	The objectives of this course are: 1. Introducing students to structural analysis, external loads, balance equations, and various reactions. 2. Identifying stable structures that are statically determinate and indeterminate 3. Structural analysis of various types of models. 4. Drawing diagrams of axial forces, shear forces, and bending moments for beams and structural members. 5. Introducing students to the principle of work-energy methods. 4. Learn about calculating deflection using the Conjugate-Beam method. 5. Learn about calculating deflection using the “Virtual Work” method for beams, frames, and trusses. 6. Finding the deflection for beams, frames, and trusses according to Casticliano’s second theorem.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the completion of the course, students are expected to be able to: 1. Identify structural analysis, Loads, Equilibrium and Support reactions. 2. Analyze statically determinate structures: Static determinacy, Indeterminacy, and Instability, Plane trusses, Shear and Bending in Beams and Frames. 3. Find the Influence line for statically determinate structures. 4. Approximate analysis of statically indeterminate structures: parallel



	chord & multiple system trusses, Frames. - Determine the deflections of beams (Conjugate-Beam Method). - Identify the Work-Energy Methods. - Understand the basics behind the statically determinate structures: Deflections of beams, Frames, Trusses (Virtual Work Method). - Analyze of statically determinate structures: Deflections of beams, Frames, Trusses (Castiglione's Second Theorem). - Analyze of statically indeterminate structures by force method (consistent deformation method). - Analyze of statically indeterminate structures by slope-deflection method. - Analyze of statically indeterminate structures by moment distribution method. - Communicate together and work teams to fulfill engineering objectives (analysis, design, and presentation).
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. "Structural Analysis," by R. C. Hibbeler 8th Edition, 2012. "Elementary Theory of Structures," by Yuan-Yu Hsieh.

COURSE SCHEDULE: -

Week	hours	Topics Covered	Learning Outcomes
Topic I: Concepts and definitions (Introduction to structural analysis)			
1	6	- Loads, Equilibrium and Support reactions.	1 and 12
Topic II: -Analysis of statically determinate structures			
2-8	42	- Static determinacy, Indeterminacy, and Instability. - Plane trusses - Shear and bending in beams and frames - Deflections of beams (Conjugate-Beam	2,4-8 and 12



		Method). - Introduction to Work-Energy Methods. - Deflections of beams, Frames and trusses (Virtual Work Method). - Deflections of Beams Frames and Trusses (Castiglione's Second Theorem).	
Topic III: - Influence line			
9	6	- Influence line for statically determinate structures	3 and 12
Topic IV: - Approximate analysis of statically indeterminate structures			
10-11	12	- Parallel chord & multiple system trusses. - Frames and beams	9 and 12
Topic V: - Analysis of statically indeterminate structures			
12-15	24	- Force method (consistent deformation method). - Slope-Deflection method - Moment distribution method	10,11 and 12
Final Exam			

**Learning Outcomes and Assessment Methods for " THEORY OF STRUCTURES
" Course.**

Topics Covered	Learning Outcomes	Strategies for Achieving Outcomes	Assessment Methods
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Topic I: Concepts and definitions (Introduction to Structural analysis)	1 and 12	Report Writing, Field Visits, Theoretical Lectures, Scientific Films, Exploratory Work Teams.	quizzes, Major reports, discussions during lectures, Written Exams, oral exam.
Topic II: - Analysis of statically determinate structures	2,4-8 and 12	Problem Based Learning, Report Writing, Field Visits, Scientific Trips, Theoretical Lectures, Small Group Discussions, Scientific Films, Exploratory Work Teams.	Seminars, Major reports, discussions during lectures. Written Exams, oral exams.
Topic III: - Influence line	3 and 12	Problem Based Learning, Report Writing, Theoretical Lectures, Small Group Discussions, Scientific Films.	Quizzes, discussions during lectures, Written Exams, Home work, oral exams.
Topic IV: - Approximate analysis of statically indeterminate structures	9 and 12	Report Writing, Scientific Trips. Theoretical Lectures, Small Group Discussions, and Scientific Films.	Seminars, Major reports, discussions during lectures. Written Exams, oral exams.
Topic V: - Analysis of statically indeterminate structures	10,11 and 12	Theoretical Lectures, Small Group Discussions,	Seminars, quizzes, discussions during lectures, Written Exams, oral exams.

Module Evaluation: -

Module Evaluation

تقييم المادة الدراسية

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		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment (40%)	Quizzes	4	10% (10)	3,5, 10, 12	LO #, 3,4,5,8,10 and 11
	Assignments & H.W.	5	10% (10)	2,4,6, 9,11	LO # 1,2,3, 4, 6, 8,10 and 11
	Seminar/ project	1	10% (10)		
	Discussions During Lectures	10	10% (10)	Continuous	ALL
Summative assessment	Midterm Exam (10%)	2 hr	10% (10)	8	LO # 1,2,4-8
	Final Exam (50%)	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

توزيع الساعات المجدولة و الغير مجدولة (SWL= SSWL +USWL)

Activity types	Structured SWL	Un structured SWL	No. of weeks	Time Factor	SWL (hr)
Class	Class Lecturers		15	4	60

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Lab.					0
Tutorial			15	2	30
Self-Study		Self-Study	15	1	15
Quizzes		Preparation for the Quizzes	4	3	12
discussions during lectures			0	0	0
Projects / Lab.	Project Work		0	0	0
		Preparation for the Project	3	3	9
Seminar	Presenting a Seminar		1	0	0
		Preparation for the Project			0
Assignments, Home Work		Preparation for the H.W.	5	1	5
Report		Preparation for the Report	3	2	6
Midterm Exam (10%)		Preparation for the Exam.	1	5	5
	Evaluation		0	0	0
Final Exam (50%)		Preparation for the Exam.	1	5	5
	Evaluation		1	3	3
		Total SWL (hr/ Semester)			150
		ECTS			6



"COURSE PORTFOLIO"

Module Information					
معلومات المادة الدراسية					
Module Title	REINFORCED CONCRETE DESIGN I			Module Delivery	
Module Type	Support			☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	QWRE 3430				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level			3		
Department			Water Resources Engineering	College	College of Engineering
Module Leader		Mustafa Kareem Hamzah		E-mail	Mustafa.kareem@wrec.uoqasim.edu.iq
Module Leader's Acad. Title			Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor		Mustafa Kareem Hamzah		e-mail	Mustafa.kareem@wrec.uoqasim.edu.iq
Peer Reviewer Name			N.A.	e-mail	N.A.
Scientific Committee Approval Date			01/06/2023	Version Number	1.0

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures) + Unstructured SWL (h/w) .

Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		



Relation with other Modules:-

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

COURSE DESCRIPTION:	This subject covers the basics of reinforced concrete design using the American Concrete Institute (ACI) code. The behavior of beams under different loading types such as bending, shear and torsion. Design of single, double and T-beam for flexure. Design the beam subjected to shear and torsion. In addition, assess the effect of cracking on beam performance. Also, design the beam based on the ACI-code deflection criteria.
Module Aims أهداف المادة الدراسية	The aims of this subject are: 1. Introducing students to the basic principles of reinforced concrete design. 2. Identify the types of beams, as well as analyze each type in detail. 3. Design the rectangular beam as a single and doubly reinforcement 4. Design the T-section beam as a rectangular or T-section for flexural loading 5. Understand the criteria of sagging and hogging moments in T-section 6. Define the concept of designing the aforementioned beams for shear and torsion loadings 7. Understand the overall effect of cracking and deflection on structural behavior of beams 8. Identify the installation length of the rebar
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the completion of the course, students are expected to be able to: 1. Have a knowledge about ACI code 2. Describe the structural effect of flexural loading on the beam 3. Design the rectangular beam as a single or doubly reinforcement depending on the applied static loading (dead load and live load) 4. Design the T-section beam for flexural and draw the reinforcement details 5. Understand the effect of positive and negative moment on the



	structural performance of RC T-beam - Design different type of beams subjected to shear or torsion or both loadings - Identify the structural effect of cracking on the beam performance - Define the deflection criteria of ACI-code to be applied to the beams - Design and check the beam based on deflection criteria - Draw reinforcement details for designed beam - Identify the bar splices and how it should be calculated and designed - Communicate together and work teams to fulfill engineering objectives (analysis, design, and presentation).
Indicative Contents المحتويات الإرشادية	References: - -Design of Reinforced Concrete Structures by Nilson ACI-Code-318M -ACI Committee 318 (2014), Building Code Requirements for Structural Concrete and Commentary (318-14). Farmington Hills, MI: American Concrete Institute.

COURSE SCHEDULE: -

Week	hours	Topics Covered	Learning Outcomes
Topic I: Introduction to Reinforced Concrete Structures			
1-2	6	- Fundamentals of Reinforced concrete Design - ACI-Code - Concrete and Steel materials	1 and 12
Topic II: - Flexural beam behavior (Analysis & Design)			
3-8	18	- Single reinforcement beam - Doubly reinforcement beam - T-Section	2-5 and 12



Topic III: -Shear & Torsion Behavior			
9-12	12	- Shear behavior in beam - Shear design for beam - Torsion behavior in beam - Torsion design for beam - Design beam for combined shear and torsion effect	6 and 12
Topic IV: - Serviceability and Deflection			
13-14	6	- Deflection ACI-Code criteria - Design beam for deflection - Cracking effect on beam	7-9 and 12
Topic V: - Bar splices			
15	3	- Development length - Overlap - Splices - Reinforcement details	10-12
Final Exam			

Learning Outcomes and Assessment Methods for " REINFORCED CONCRETE DESIGN I " Course.

Topics Covered	Learning Outcomes	Strategies for Achieving Outcomes	Assessment Methods
Topic I: Introduction to Reinforced Concrete Structures	1 and 12	Report Writing, Field Visits, Theoretical Lectures, Scientific Films, Exploratory Work Teams.	quizzes, Major reports, discussions during lectures, Written Exams, oral exam.
Topic II: - Flexural beam behavior (Analysis & Design)	2-5 and 12	Problem Based Learning, Report Writing, Field Visits, Scientific Trips, Theoretical Lectures, Small Group Discussions, Scientific Films, Exploratory Work Teams.	Seminars, Major reports, discussions during lectures. Written Exams, oral exams.
Topic III: - Shear &	6 and 12	Problem Based Learning, Report Writing, Theoretical Lectures,	Quizzes, discussions during lectures, Written Exams,



<i>Torsion Behavior</i>		Small Group Discussions, Scientific Films.	Home work, oral exams.
<i>Topic IV: - Serviceability and Deflection</i>	7-9 and 12	Report Writing, Scientific Trips. Theoretical Lectures, Small Group Discussions, and Scientific Films.	Seminars, Major reports, discussions during lectures. Written Exams, oral exams.
<i>Topic V: - Bar splices</i>	10-12	Theoretical Lectures, Small Group Discussions,	Seminars, quizzes, discussions during lectures, Written Exams, oral exams.

Module Evaluation: -

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment (40%)	Quizzes	4	10% (10)	3,5, 10, 12	LO #, 3,4,5,8,10 and 11
	Assignments & H.W.	5	10% (10)	2,4,6, 9,11	LO # 1-11
	Seminar/ project	1	10% (10)		
	Discussions During Lectures	10	10% (10)	Continuous	ALL
Summative assessment	Midterm Exam (10%)	2 hr	10% (10)	8	LO # 1-8
	Final Exam (50%)	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

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Al-Qasim Green University/ College of Engineering
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(SWL= SSWL +USWL) توزيع الساعات المجدولة و الغير مجدولة

Activity types	Structured SWL	Un structured SWL	No. of weeks	Time Factor	SWL (hr)
Class	Class Lecturers		15	2	30
Lab.					0
Tutorial			15	1	15
Self-Study		Self-Study	15	1	15
Quizzes		Preparation for the Quizzes	2	5	10
discussions during lectures			0	0	0
Projects / Lab.	Project Work		0	0	0
		Preparation for the Project	0	0	0
Seminar	Presenting a Seminar		0	0	0
		Preparation for the Project			0
Assignments, Home Work		Preparation for the H.W.	5	1	5
Report		Preparation for the Report	3	4	12
Midterm Exam (10%)		Preparation for the Exam.	1	5	5
	Evaluation		0	0	0
Final Exam (50%)		Preparation for the Exam.	1	5	5
	Evaluation		1	3	3
		Total SWL (hr/ Semester)			100
		ECTS			4



"COURSE PORTFOLIO"

Module Information معلومات المادة الدراسية			
Module Title	Soil Mechanics		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	QWRE3631		
ECTS Credits	6		
SWL (hr/sem)	150		
Module Level	3	Semester	5
Department	Water Resources Engineering	College	College of Engineering
Module Leader		E-mail	
Module Leader's Acad. Title		Module Leader's Qualification	
Module Tutor		e-mail	
Peer Reviewer Name	N.A.	e-mail	N.A.
Scientific Committee Approval Date		Version Number	1.0

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures+2hr lab+1hr tutorial) + Unstructured SWL (h/w) .

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	78	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	5.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		



Relation with other Modules: -

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

COURSE DESCRIPTION:	"Introduction to Soil and Soil Mechanics" is a foundational course that covers the formation, composition, and mechanical properties of soil. It explores the nature of water in soil, consistency, and Atterberg limits, as well as particle size distribution and grain gradation in soils. The course also delves into soil classification, including the Unified Soil Classification System. Students learn about stress within soil masses, encompassing total and effective stress and pore water pressure in static conditions. Phase relationships in soils and the advantages of soil compaction are explored, along with one-dimensional water flow through soil. The course concludes with an examination of the stresses in soil generated by surface loads, which is crucial for engineering projects involving soil
Module Aims أهداف المادة الدراسية	The main module aims for the topics in this soil mechanics and geotechnical engineering course are to provide students with a comprehensive understanding of soil mechanics, its composition, and practical applications. Students will learn to analyze the role of water in soil, classify soils accurately, and determine stress within soil masses under various conditions. They will also grasp the significance of particle size distribution, the Unified Soil Classification System, phase relationships in soils, and the advantages of soil compaction. The course aims to equip students with the knowledge and skills required



	for effective engineering decision-making, including the analysis of water flow through soil and the assessment of stresses induced by surface loads.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the completion of the course, students are expected to be able to: 1- Develop a foundational understanding of soil mechanics and its real-world applications in engineering projects. 2- Identify the components of soil and their impact on soil behavior, enabling better decision-making in soil-related projects. 3- Gain the ability to assess soil moisture and its effect on engineering properties, ensuring proper soil management. 4- Understand how particle size distribution and grain gradation influence soil characteristics, aiding in material selection and project design. 5- Master the skill of accurately classifying soils, enhancing the suitability of soil for specific construction purposes. 6- Proficiently apply the Unified Soil Classification System to categorize soils and make informed engineering decisions. 7- Calculate and analyze stress within soil masses, including pore water pressure, under static conditions, ensuring safe and stable designs. 8- Understand the interplay between solid, liquid, and gaseous components in soils and appreciate the advantages of soil compaction for project durability. 9- Acquire the expertise to assess one-dimensional water flow through soil, a critical skill for groundwater management and drainage. 10- Analyze the effects of surface loads on soil stress, facilitating the design and evaluation of foundations and structural elements
Indicative Contents	Indicative content includes the following. Principles of Geotechnical Engineering, 8th Edition SOIL MECHANICS , JOHN WILEY & SONS

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	Geotechnical Engineering , V. N. S. Murthy SOIL MECHANICS , Arnold Verruijt
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COURSE SCHEDULE:-

Week	hours	Topics Covered	Learning Outcomes
Topic1			
1	3	Introduction to Soil and Soil Mechanics	1
Topic 2			
2,3	6	Soil formation and Composition and Description of Individual of Soil Particles	2
Topic 3			
4	3	Nature of Water in Soil , Consistency and Atterberg Limits	3
Topic 4			
5	3	Particle Size Distribution of Fine and Coarse Soils and Grain Gradation	4
Topic 5			
6	3	Soil Classification	5
Topic 6			
7	3	Unified Soil Classification System	6



Topic 7			
8,9	6	Phase Relationships in Soils and Benefits of Soil Compaction	7
Topic 8			
10,11	6	Stress Within Soil Mass , Total and Effective Stress and Pore Water Pressure in Static Condition	8
Topic 9			
12	3	One Dimensional Flow of Water through Soil	9
Topic 10			
13,14,15	9	Stresses in Soil Due to Surface Loads	10
Final Exam			

Learning Outcomes and Assessment Methods

Topics Covered	Learning Outcomes	Strategies for Achieving Outcomes	Assessment Methods
Topic 1: Introduction to Soil and Soil Mechanics	1	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks , discussions during lectures reports
Topic 2: Soil formation and Composition and Description of Individual of Soil Particles	2	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures, Written Exams.
Topic 3: Nature of Water in Soil , Consistency and Atterberg Limits	3	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures, Written Exams.
Topic 4: Particle Size Distribution of Fine and Coarse Soils and Grain	4	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group	quizzes, HomeWorks, discussions during lectures, Written Exams.

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Gradiation		Discussions,	
Topic 5: Soil Classification	5	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures, Written Exams.
Topic 6: Unified Soil Classification System	6	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures, Written Exams.
Topic 7: Phase Relationships in Soils and Benefits of Soil Compaction	7	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures, Written Exams.
Topic 8: Stress Within Soil Mass , Total and Effective Stress and Pore Water Pressure in Static Condition	8	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures, Written Exams.
Topic 9: One Dimensional Flow of Water through Soil	9	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures, Written Exams.
Topic 10: Stresses in Soil Due to Surface Loads	10	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures, Written Exams.

Module Evaluation:-

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment (40%)	Quizzes	٣	30% (30)	٣,٧, 10	ALL
	Assignments & H.W.	4	5% (5)	2,6,9,12	ALL
	Discussions	5	5% (5)	Continuous	ALL

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	During Lectures				
Summative assessment (60%)	Midterm Exam (10%)	2hr	10% (10)	12	ALL
	Final Exam (50%)	3hr	50% (50)	16	ALL
Total assessment			100% (100 Marks)		

(SWL= SSWL +USWL) توزيع الساعات المجدولة و الغير مجدولة

Activity types	Structured SWL	Un structured USWL	No. of weeks	Time Factor	SWL (hr)
Class	Class Lecturers		15	2	30
Lab.	Lab.		15	2	30
Tutorial	Tutorial		15	1	15
Self Study		Self Study	15	2	30
Quizzes		Preparation for the Quizzes	3	4	12
discussions during lectures			5	1	5
Projects / Lab.	Project Work		0	0	0
		Preparation for the Project	0	0	0
Seminar	Presenting a Seminar		0	0	0
		Preparation for the Project			
Assignments, Homework		Preparation for the H.W.	4	2	8
Report		Preparation for the Report	0	0	0
Midterm Exam (10%)		Preparation for the Exam.	1	5	5
	Evaluation				
Final Exam (50%)		Preparation for the Exam.	1	12	12
	Evaluation		1	3	3
		Total SWL (hr/ Semester)			150
		ECTS			6



"COURSE PORTFOLIO"

Module Information معلومات المادة الدراسية			
Module Title	Engineering Hydrology		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar
Module Code	QWRE3432		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester	5
Department	Water Resources Engineering	College	College of Engineering
Module Leader	Mohammed Hamid Rasool	E-mail	m.h.rasool@wrec.uoqasim.edu.iq
Module Leader's Acad. Title	Assist Professor	Module Leader's Qualification	MSc.
Module Tutor	Mohammed Hamid Rasool	e-mail	m.h.rasool @wrec.uoqasim.edu.iq
Peer Reviewer Name	N.A.	e-mail	N.A.
Scientific Committee Approval Date	16/10/2023	Version Number	1.0

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures) + Unstructured SWL (h/w) .

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		



Relation with other Modules: -

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

COURSE DESCRIPTION:	Students will undertake a comprehensive hydrological study focused on unraveling the governing principles behind the presence, distribution, and dynamic movement of water within watershed systems. This in-depth exploration covers a range of topics, encompassing meteorological considerations, precipitation patterns, evaporation processes, infiltration dynamics, the behavior of streamflow, meticulous hydrograph analysis, flood routing methodologies and the systematic analysis of frequency patterns. This holistic examination will equip students with a profound understanding of the intricate workings of watershed systems.
Module Aims أهداف المادة الدراسية	The aim of this course is to equip students with a fundamental grasp of hydrologic data and processes. This knowledge enables students to predict the peak discharge or storm hydrograph for a specific watershed based on its design frequency. Moreover, students will gain the ability to forecast the transformation of hydrographs as they traverse through reservoirs or stream channels using suitable routing techniques. The course also covers the understanding of groundwater flow processes and the mechanics of well hydraulics, providing students with a comprehensive understanding of hydrology.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the completion of the course, students are expected to be able to: 1. Define hydrological cycle. 2. Define precipitation . 3. Calculate average precipitation over area. 4. Test for consistency of records. 5. Calculate Evapotranspiration. 6. Calculate infiltration. 7. Draw flow-duration curve. 8. Draw flow-mass curve. 9. Define components of Hydrograph. 10. Base flow separation

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	11. Determine and derivate Unit Hydrograph 12. Define flood 13. Calculate flood routing.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1- Applied Hydrology" by Ven Te Chow 2- Engineering Hydrology" by K. Subramanya 3- Principles of Hydrology" by M. K. Jaya Madhav 4- Introduction to Hydrology" by Warren Viessman

COURSE SCHEDULE:-

<i>Week</i>	<i>hours</i>	<i>Topics Covered</i>	<i>Learning Outcomes</i>
<i>Topic I: Introduction</i>			
1	3	Introduction to Hydrology and Hydrologic Cycle	1
<i>Topic II: - Precipitation</i>			
2	6	Forms of precipitation, Estimating missing precipitation data, Double mass curve analysis, Determining average precipitation, presentation of rainfall data	2,3,4
<i>Topic III: - Abstraction from Precipitation</i>			
1	3	Evaporation Equations, Evapotranspiration Equations, Infiltration capacity	5,6

<i>Topic IV: - Run-off</i>			
2	6	Natural flow, Yield estimation Methods, Flow-duration curve, Flow-Mass curve, calculation of storage volume	7,8
<i>Topic V: - Hydrograph</i>			
3	9	Components oh hydrograph, Factor affecting flood hydrograph, Recession curve equation, Base flow separation methods, Effective rainfall, Unit Hydrograph	9,10,11

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Topic VI: - Floods			
4	12	Rational method, Time of concentration, Flood frequency studies, flood routing	12,13
Final Exam			

Learning Outcomes and Assessment Methods

Topics Covered	Learning Outcomes	ABET Outcomes	Assessment Methods
Topic I: Introduction	1	b,f,h,I,j	discussions during lectures, Written Exams
Topic II: - Precipitation	2,3,4	a,b,e	discussions during lectures. Home works, Written Exams, oral exams.
Topic III: - Abstraction from Precipitation	5,6	a,j,k	Quizzes, discussions during lectures, Written Exams, Home work, oral exams.
Topic IV: - Run-off	7,8	a,b,e,h,k	Seminars, Major reports, discussions during lectures. Written Exams, oral exams.
Topic V: - Hydrograph	9,10,11	a,b,e,h	Seminars, Major reports, quizzes, discussions during lectures, Written Exams, oral exams.
Topic VI: - Floods	12,13	a,b,d,e,f,I,j	Seminars, quizzes, Major reports, Written Exams, Home work, oral exams.

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Module Evaluation:-

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment (40%)	Quizzes	٣	30% (30)	٣,٧, 10	ALL
	Assignments & H.W.	4	5% (5)	2,6,9,12	ALL
	Discussions During Lectures	5	5% (5)	Continuous	ALL
Summative assessment (60%)	Midterm Exam (10%)	2hr	10% (10)	12	ALL
	Final Exam (50%)	3hr	50% (50)	16	ALL
Total assessment			100% (100 Marks)		



(SWL= SSWL +USWL) توزيع الساعات المجدولة و الغير مجدولة

Activity types	Structured SWL	Un structured USWL	No. of weeks	Time Factor	SWL (hr)
Class	Class Lecturers		15		
Lab.					
Tutorial			15		
Self Study		Self Study	15		
Quizzes		Preparation for the Quizzes	3		
discussions during lectures			5		
Projects / Lab.	Project Work		0		
		Preparation for the Project	0		
Seminar	Presenting a Seminar		0		
		Preparation for the Project			
Assignments, Homework		Preparation for the H.W.	6		
Report		Preparation for the Report	0		
Midterm Exam (10%)		Preparation for the Exam.	1		
	Evaluation		1		
Final Exam (50%)		Preparation for the Exam.	1		
	Evaluation		1		
		Total SWL (hr/ Semester)			100
		ECTS			4



"COURSE PORTFOLIO"

Module Information معلومات المادة الدراسية					
Module Title	Engineering analysis			Module Delivery	
Module Type	Basic			☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	QWRE3333				
ECTS Credits	3				
SWL (hr/sem)	75				
Module Level		3	Semester		5
Department		Water Resources Engineering	College	College of Engineering	
Module Leader	NOORA SALIM ALWAN		E-mail	Noora.salim@wrec.uoqasim.edu.iq	
Module Leader's Acad. Title		Assist Professor	Module Leader's Qualification		Ph.D.
Module Tutor	NOORA SALIM ALWAN		e-mail	Noora.salim@wrec.uoqasim.edu.iq	
Peer Reviewer Name		N.A.	e-mail	N.A.	
Scientific Committee Approval Date		25/10/2023	Version Number	1.0	

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures) + Unstructured SWL (h/w) .

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	33	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	2.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	42	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	2.8
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	75		

Relation with other Modules: -



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	
COURSE DESCRIPTION:	This description provides a necessary summary of the most important characteristics of the course and the learning outcomes that the student is expected to achieve, demonstrating whether he has made the most of the available learning opportunities. They must be linked to the program description
Module Aims أهداف المادة الدراسية	The content of the module was designed to achieve the aims of providing skills in the application of engineering analysis concepts that underpin all of Engineering. To encourage the development of problem solving as required in other Year 1 modules and in order that more advanced material can be tackled in modules taught in later years. Also, this module is aiming to develop an understanding of the principles of general basic a techniques of relevance to Engineers and develop sufficient mathematical competence to cope with the compulsory content of a Management Engineering degree.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the completion of the course, students are expected to be able to: 1. Obtain the ability to classify the differential equations. 2. Obtain the ability to drive some differential equations. 3. Obtain the ability to solve some differential equations exactly. 4. Obtain the ability to solve some engineering applications. 5. Obtain ability to modeling some engineering problems exactly. 6. Improved and development student experiences in advance engineering mathematics.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Advanced Engineering Mathematics 8Ed - Erwin Kreyszig 2. Advanced Mathematics for Engineering and Science C F Chan Man Fong, D De Kee, Tulane University, USA, P N Kaloni University of Windsor, Canada 3. Numerical Mathematics, AlfioQuarteroni, Riccardo Sacco, FaustoSaleri.

COURSE SCHEDULE:-



Week	hours	Topics Covered	Learning Outcomes
Topic I			
1	3	<i>Review and general principles, classifications of differential equations</i>	1,6
Topic II			
2	3	<i>Solutions of first order differential equations</i>	1, 3, 6
3	3	<i>Separable variables method, Separable variables by using suitable assumption, Exact D.E. of first order</i>	1, 3, 6
4	3	<i>Partially exact D.E. of first order, Linear first order D.E.</i>	1, 3, 6
5	3	<i>Spatial case linear first order D.E., D.E. solvable for variable x or y</i>	1, 3, 6
6	3	<i>Method of grouping terms, Method of inspection</i>	1, 3, 6
7	3	<i>Method of integrating factor by group</i>	1, 3, 6
8	3	<i>Applications of first order ordinary D.E.</i>	2, 3, 4, 5, 6
Topic III			
9	3	<i>Second and higher order D.E., Partial D.E.</i>	1, 3, 6
10		<i>Solution of homogeneous second order D.E. with constant coefficient</i>	1, 3, 6
11		<i>Solution of nonhomogeneous second order D.E. with constant coefficient, method of undeterminant coefficient, Solution of nonhomogeneous second order D.E. with constant coefficient, method of variation of parameters</i>	1, 3, 6
12		<i>Solution of higher order ordinary D.E. with constant coefficient</i>	1, 3, 6
13		<i>Solution of ordinary D.E. with variable coefficients using Euler-Cauchy method</i>	1, 3, 6
14		<i>Applications of second and higher order D.E.</i>	2, 3, 4, 5, 6
15		<i>Solution of Simultaneous ordinary linear D.E. with applications</i>	1, 2, 3, 4, 5, 6
Final Exam			



Learning Outcomes and Assessment Methods

Topics Covered	Learning Outcomes	Strategies for Achieving Outcomes	Assessment Methods
<i>Topic I: Review and general principles, classifications of differential equations</i>	1,3,4,5,6	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks , discussions during lectures, Written Exams.
<i>Topic II: - Solutions of first order deferential equations</i>	1,2,3,4,5,6	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures, Written Exams.
<i>Topic III: Second and higher order D.E., Partial D.E.</i>	1,2,3,4,5,6	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures, Written Exams.

Module Evaluation:-

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment (40%)	Quizzes	٣	30% (30)	٣,٧, 10	ALL
	Assignments & H.W.	6	5% (5)	2,6,9,12	ALL
	Discussions During Lectures	5	5% (5)	Continuous	ALL
Summative assessment (60%)	Midterm Exam (10%)	2hr	10% (10)	12	ALL
	Final Exam (50%)	3hr	50% (50)	16	ALL
Total assessment			100% (100 Marks)		



توزيع الساعات المجدولة و الغير مجدولة (SWL= SSWL +USWL)

Activity types	Structured SWL	Un structured USWL	No. of weeks	Time Factor	SWL (hr)
Class	Class Lecturers		15	6	90
Lab.					
Tutorial			15	2	30
Self Study		Self Study	15	2	30
Quizzes		Preparation for the Quizzes	3	4	12
discussions during lectures			5	1	5
Projects / Lab.	Project Work		0	0	0
		Preparation for the Project	0	0	0
Seminar	Presenting a Seminar		0	0	0
		Preparation for the Project			
Assignments, Homework		Preparation for the H.W.	6	2	12
Report		Preparation for the Report	0	0	0
Midterm Exam (10%)		Preparation for the Exam.	1	5	5
	Evaluation		1	1	1
Final Exam (50%)		Preparation for the Exam.	1	12	12
	Evaluation		1	3	3
		Total SWL (hr/ Semester)			225
		ECTS			9

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"COURSE PORTFOLIO"

Module Information					
معلومات المادة الدراسية					
Module Title	Open channel Hydraulic II			Module Delivery	
Module Type	Core			☒ Theory ☐ Lecture ☒ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	QWRE3734				
ECTS Credits	7				
SWL (hr/sem)	175				
Module Level		3	Semester		6
Department		Water Resources Engineering	College	College of Engineering	
Module Leader	Mohammed Hamid Rasool		E-mail	m.h.rasool@wrec.uoqasim.edu.iq	
Module Leader's Acad. Title		Assist Professor	Module Leader's Qualification		MSc.
Module Tutor	Mohammed Hamid Rasool		e-mail	m.h.rasool @wrec.uoqasim.edu.iq	
Peer Reviewer Name		N.A.	e-mail	N.A.	
Scientific Committee Approval Date		16/10/2023	Version Number	1.0	

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures) + Unstructured SWL (h/w) .

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	93	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	6.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	82	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	5.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	175		



Relation with other Modules: -

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	None	Semester	QWRE3727
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

COURSE DESCRIPTION:	The course covers topics related to open channel hydraulics normally covered at the level beyond the undergraduate level in water resources engineering and civil engineering. The focus is on advanced topics for open channel flow including basic concepts of the energy and momentum principles, flow resistance in uniform and non uniform channels, flow in compound channels, natural channels, transitions, unsteady flows and flood routing. Application of the basic principles using the commonly used models is also studied.
Module Aims أهداف المادة الدراسية	The purpose of this course is to introduce the basic concepts and principles of fluid mechanics and hydraulics. Then, to apply this knowledge to the investigation, analysis, design and review of civil engineering infrastructure relating to management of the water cycle and environmental protection in open channels. Whilst following this module, students will acquire the confidence to be able to select appropriate techniques of analysing open channel flow and apply them to realistic engineering problems. Students will also acquire practical experience through several laboratory experiments which reinforce the theoretical fundamentals taught in lectures.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the completion of the course, students are expected to be able to: 1. Quantify the impact of the hydrological cycle on the evaluation and design of civil engineering infrastructure related to urban and rural catchment problems. 2. Recognise the classification of open channel flow and understand the development and application of flow resistance equations for the uniform flow case. 3. Apply the principles of energy and momentum to solve a range of open channel flow problems. 4. Evaluate gradually varied flow profiles in open channels using both theoretical

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	perspectives and quantitative assessment. 5. Develop and appraise design approaches applicable to a selected range of hydraulic structures.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Sturm, Terry, 2001, Open Channel Hydraulics, McGraw-Hill 2. Chow, V.T., 1959, Open Channel Hydraulics, McGraw Hill 3. Henderson, F.M., 1966, Open Channel Flow, MacMillan. 4. French, R.H., 1985, Open Channel Hydraulics

COURSE SCHEDULE:-

Week	hours	Topics Covered	Learning Outcomes
Topic I			
1	6	Review of basic fluid mechanics and hydraulics: The purpose	1
Topic II			
2	6	Dimensionless Specific Energy Diagrams for Open Channel Flow	1
Topic III			
3	6	Energy conservation	1, 2
Topic IV			
4	6	Choke conditions	2, 3
Topic V			

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5	6	Gradually-varied Flow Profiles in Open Channels	3, 4
Topic VI			
6	6	The GVF equation for flow in Open Channels Momentum :-Introduction	5
Topic VII			
7	6	The GVF equation for flow in Open Channels Momentum	6
Topic VIII			
8	6	Basic backwater calculations	7
Topic IX			
9	6	Uniform flow, Non - Uniform flow	8
Topic X			
10	6	Control sections , Transitions	9
Topic XI			
11	6	Hydraulic Jump	10
Topic XII			
12	4	Sub and supercritical conditions	11
Topic XIII			
13,14,15	18	Scouring , sediment transport	12, 13, 14, 15
Final Exam			

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Learning Outcomes and Assessment Methods

Topics Covered	Learning Outcomes	ABET Outcomes	Assessment Methods
<i>Topic I</i>	1	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic II</i>	1	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic III</i>	1, 2	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic IV</i>	2, 3	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic V</i>	3, 4	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic VI</i>	5	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic VII</i>	6	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.
<i>Topic VIII</i>	7	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.

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Topic IX	8	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.
Topic X	9	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.
Topic XI	10	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.
Topic XII	11	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.
Topic XIII	12, 13, 14, 15	Problem Based Learning, Critical thinking questions, Theoretical Lectures, tutorials, Small Group Discussions,	quizzes, discussions during lectures, Written Exams, oral exams.

Module Evaluation:-

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment (40%)	Quizzes	4	20% (20)	٣,٧, 10	ALL
	Lab. Report	5	10% (10)	٣,٧, 10	ALL
	Assignments & H.W.	4	5% (5)	2,6,9,12	ALL

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	Discussions During Lectures	5	5% (5)	Continuous	ALL
Summative assessment (60%)	Midterm Exam (10%)	2hr	10% (10)	12	ALL
	Final Exam (50%)	3hr	50% (50)	16	ALL
Total assessment			100% (100 Marks)		

(SWL= SSWL +USWL) توزيع الساعات المجدولة و الغير مجدولة

Activity types	Structured SWL	Un structured USWL	No. of weeks	Time Factor	SWL (hr)
Class	Class Lecturers		15		
Lab.					
Tutorial			15		
Self Study		Self Study	15		
Quizzes		Preparation for the Quizzes	3		
discussions during lectures			5		
Projects / Lab.	Project Work		0		

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		Preparation for the Project	0		
Seminar	Presenting a Seminar		0		
		Preparation for the Project			
Assignments, Homework		Preparation for the H.W.	6		
Report		Preparation for the Report	0		
Midterm Exam (10%)		Preparation for the Exam.	1		
	Evaluation		1		
Final Exam (50%)		Preparation for the Exam.	1		
	Evaluation		1		
		Total SWL (hr/ Semester)			
		ECTS			9



"COURSE PORTFOLIO"

Module Information						
معلومات المادة الدراسية						
Module Title	REINFORCED CONCRETE DESIGN II			Module Delivery		
Module Type	Support			☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar		
Module Code	QWRE3535					
ECTS Credits	5					
SWL (hr/sem)	125					
Module Level			3			Semester
Department		Water Resources Engineering		College	College of Engineering	
Module Leader		Mustafa Kareem Hamzah		E-mail	Mustafa.kareem@wrec.uoqasim.edu.iq	
Module Leader's Acad. Title		Lecturer		Module Leader's Qualification		Ph.D.
Module Tutor		Mustafa Kareem Hamzah		e-mail	Mustafa.kareem@wrec.uoqasim.edu.iq	
Peer Reviewer Name		N.A.		e-mail	N.A.	
Scientific Committee Approval Date		01/06/2023		Version Number	1.0	

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures) + Unstructured SWL (h/w) .

Student Workload (SWL) الحمل الدراسي للطلاب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطلاب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطلاب أسبوعياً	4.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطلاب خلال الفصل	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطلاب أسبوعياً	4.13
Total SWL (h/sem) الحمل الدراسي الكلي للطلاب خلال الفصل	125		



Relation with other Modules:-

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

COURSE DESCRIPTION:	This covers the structural behavior of different slabs such as solid one-way, two-way slab, flat slab and waffle slab. Then, design the aforementioned slabs using the concept of reinforced concrete design and following the American Concrete Institute (ACI) code. Design of members subjected to axial load, flexure, and shear; methods to account for slenderness effects. Classify the columns into two types: short and cylinder. After that, perform RC design for columns.
Module Aims أهداف المادة الدراسية	The aims of this subject are: 1. Introducing students to the basic principles of reinforced concrete design. 2. Spread knowledge about load transfer from slabs to beams then to the columns, after that to the foundation 2. Identify the types of slabs, as well as design and analyze each type in detail. 3. Study of concrete columns and methods of designing and analyzing them. 4. Compare the structural effect of types of columns based on material, length and wither including with side sway or not. 4. Identify the installation length of the rebar
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the completion of the course, students are expected to be able to: 1. Identify the impact of load transfer between structural members 2. Calculate the overall static load transferred from slab to beam 3. Differentiate between concrete slab types 4. Select the suitable slab for different load values 5. Design one-way solid slab and demonstrate the reinforcement details for such kind of slabs 6. Understand when we should use ribbed slab as a structural system to be designed 7. Identify the structural behavior of two-way slab



	8. Design two way solid and waffle slabs in different methods 9. Differentiate between types of columns in terms of material, length and if the column is subjected to side sway or not 10. Designing concrete column (short and cylinder) 11. Introduce the basic concept of prestress 12. Compare between pre-tension and post-tension beams 13. Design concrete beams either pre-tension or post-tension 14. Communicate together and work teams to fulfill engineering objectives (analysis, design, and presentation).
Indicative Contents المحتويات الإرشادية	References: - -Design of Reinforced Concrete Structures by Nilson ACI-Code-318M -ACI Committee 318 (2014), Building Code Requirements for Structural Concrete and Commentary (318-14). Farmington Hills, MI: American Concrete Institute.

COURSE SCHEDULE: -

Week	hours	Topics Covered	Learning Outcomes
Topic I: Load transfer between structural members			
1-2	8	- Load transfer from slab to beam	1, 2, and 14
Topic II: - One-way slab			
3-5	12	- Behavior of slab systems - Analysis and design of one-way solid slab - Designing of ribbed slab	3-6 and 14
Topic III: -Two-way slab			
6-9	16	- Behavior of two-way slab - Types of two-way slab - Design two-way solid slab - Design of waffle slab	3,4,7,8 and 14



Topic IV: - Reinforced concrete Columns			
10-13	16	- Column types - Analysis and design short columns - Analysis and design long columns	9,10 and 14
Topic V: - Prestressing			
14-15	8	- Pre-tension - Post-tension	11-14
Final Exam			

Learning Outcomes and Assessment Methods for " REINFORCED CONCRETE DESIGN II " Course.

Topics Covered	Learning Outcomes	Strategies for Achieving Outcomes	Assessment Methods
Topic I: Load transfer between structural members	1, 2, and 14	Report Writing, Field Visits, Theoretical Lectures, Scientific Films, Exploratory Work Teams.	quizzes, Major reports, discussions during lectures, Written Exams, oral exam.
Topic II: - One-Way slab	3-6 and 14	Problem Based Learning, Report Writing, Field Visits, Scientific Trips, Theoretical Lectures, Small Group Discussions, Scientific Films, Exploratory Work Teams.	Seminars, Major reports, discussions during lectures. Written Exams, oral exams.
Topic III: - Two-Way slab	3,4,7,8 and 14	Problem Based Learning, Report Writing, Theoretical Lectures, Small Group Discussions, Scientific Films.	Quizzes, discussions during lectures, Written Exams, Home work, oral exams.
Topic IV: - Reinforced concrete columns	9,10 and 14	Report Writing, Scientific Trips. Theoretical Lectures, Small Group Discussions, and Scientific Films.	Seminars, Major reports, discussions during lectures. Written Exams, oral exams.
Topic V: - Prestressing Technique	11-14	Theoretical Lectures, Small Group Discussions,	Seminars, quizzes, discussions during lectures, Written Exams, oral exams.

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Module Evaluation: -

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment (40%)	Quizzes	4	10% (10)	3,5, 10, 12	LO #, 3,4,5,8,10 and 11
	Assignments & H.W.	5	10% (10)	2,4,6, 9,11	LO # 1-11
	Seminar/ project	1	10% (10)		
	Discussions During Lectures	10	10% (10)	Continuous	ALL
Summative assessment	Midterm Exam (10%)	2 hr	10% (10)	8	LO # 1-8
	Final Exam (50%)	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		



(SWL= SSWL +USWL) توزيع الساعات المجدولة و الغير مجدولة

Activity types	Structured SWL	Un structured SWL	No. of weeks	Time Factor	SWL (hr)
Class	Class Lecturers		15	3	45
Lab.					0
Tutorial			15	1	15
Self-Study		Self-Study	15	1	15
Quizzes		Preparation for the Quizzes	4	3	12
discussions during lectures			0	0	0
Projects / Lab.	Project Work		0	0	0
		Preparation for the Project	3	3	9
Seminar	Presenting a Seminar		1	0	0
		Preparation for the Project			0
Assignments, Home Work		Preparation for the H.W.	5	1	5
Report		Preparation for the Report	3	2	6
Midterm Exam (10%)		Preparation for the Exam.	1	5	5
	Evaluation		0	0	0
Final Exam (50%)		Preparation for the Exam.	1	10	10
	Evaluation		1	3	3
		Total SWL (hr/ Semester)			125
		ECTS			5



"COURSE PORTFOLIO"

Module Information					
معلومات المادة الدراسية					
Module Title	FOUNDATIONS			Module Delivery	
Module Type	Support			☒ Theory ☐ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	QWRE3536				
ECTS Credits	5				
SWL (hr/sem)	125				
Module Level		3	Semester		6
Department		Water Resources Engineering	College	College of Engineering	
Module Leader		Mustafa Kareem Hamzah		E-mail	Mustafa.kareem@wrec.uoqasim.edu.iq
Module Leader's Acad. Title		Lecturer		Module Leader's Qualification	Ph.D.
Module Tutor		Mustafa Kareem Hamzah		e-mail	Mustafa.kareem@wrec.uoqasim.edu.iq
Peer Reviewer Name		N.A.		e-mail	N.A.
Scientific Committee Approval Date		01/06/2023		Version Number	1.0

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures) + Unstructured SWL (h/w) .

Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem)	63	Structured SWL (h/w)	4.2
الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعياً	
Unstructured SWL (h/sem)	62	Unstructured SWL (h/w)	4.13
الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعياً	
Total SWL (h/sem)	125		
الحمل الدراسي الكلي للطالب خلال الفصل			



Relation with other Modules:-

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	QWRE3630	Semester	5
Co-requisites module	None	Semester	

Module Aims, Learning Outcomes and Indicative Contents	
أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
COURSE DESCRIPTION:	The current course comprises the fundamentals of engineering foundation, deliberate the basic concept of the effect of soil on the behavior of structure and the need for foundation analysis and design. The subject also describes the site investigations required in soils surrounded the study area. Furthermore, discuss different types of shallow and deep foundation. Likewise, determine the bearing capacity of shallow footing in addition to understanding the impact of settlement on the shallow foundation. The other part of this course demonstrates the foundation dimensions and overall structural design procedure for each type of foundation. Assessment of footing behavior of difficult soil conditions such as collapse and expensive soil.
Module Aims أهداف المادة الدراسية	The objective of this course is to enable the student to analyze and design different type of shallow and deep foundation. This may be achieved by studying the steps before design the footing such as the soil exploration and site investigations. Determining the boreholes properties and soil sampling. Moreover, understand the shear failure types that effect on the footing. Also, introduce the concept of ultimate bearing capacity theories. Another aim of studying this course is to define the eccentrically loaded foundation. Determination of footing dimensions is a comprehensive part of structural design and analysis. After that, the foundation will be able to be designed as either shallow or deep foundation.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the completion of the course, students are expected to be able to: 1. Perform different method of site investigation and soil exploration 2. Identify the type and method of drilling, sampling and samples 3. Classify the types of shear failure on foundation 4. Determine the soil bearing capacity 5. Recognize the types of settlement such as elastic, consolidation and secondary 6. Predict the settlement for cohesive and cohesionless soils in addition to allowable settlement



7. Determine the foundation dimensions
8. Design different shallow and deep foundation
9. Analyze the Foundation on good and difficult soils
10. Identify the collapsed and expensive soils and their effect on the performance of the foundation
11. Design deep foundation such as piles
12. Communicate together and work teams to fulfill engineering objectives (analysis, design, and presentation).

Indicative Contents

المحتويات الإرشادية

References: - ١٩٨٥. - هندسة الأسس تأليف الدكتور يوسف الشكري والدكتور نوري العدي،
Principles of Foundation Engineering by Braja M. Das 7th Edition, 2011.
- Foundation Analysis and Design 5th Edition by Joseph E. Bowles, 1997.
- Basic of foundation Design by Bengt H. Fellenius, 2006.

COURSE SCHEDULE: -

Week	hours	Topics Covered	Learning Outcomes
Topic I: Site Investigations & Soil Exploration			
1-2	8	Determination of spacing, no. of boreholes, depth of bore holes, type and methods of drilling, sampling and samples, in situ tests, geophysical exploration, and soil investigation report	1, 2, and 12
Topic II: - Bearing capacity of shallow foundation			
3-6	16	Types of shear failure, determination of ultimate bearing capacity of soil, eccentrically loaded foundations, bearing capacity of footing on layered soils, bearing capacity of footing on slopes, determination of bearing capacity from field tests.	3,4, and 12



Topic III: - Settlements of shallow foundations			
7-8	8	Immediate or elastic settlements, consolidation settlements, secondary settlements, prediction of settlement for cohesion-less soils, elastic settlements of eccentrically loaded foundations, allowable settlements.	5,6 and 12
Topic IV: -Determination of footing dimensions			
9-11	8	Spared , Combined Rectangular and Trapezoidal and Raft foundations	7 and 12
Topic V: - Structural design of foundations			
12-13	8	Separated footings, Combined footings, Rectangular footings, Trapezoidal footings, Strap footings, and Raft foundations.	8 and 12
Topic VI: - Foundations on difficult soils			
14	4	Collapsing soils and expansive soils	9,10 and 12
Topic VII: - Deep foundation			
15	8	- Piles - Structural design of deep foundation	11 and 12
Final Exam			



Learning Outcomes and Assessment Methods for " ENGINEERING FOUNDATIONS " Course.

Topics Covered	Learning Outcomes	Strategies for Achieving Outcomes	Assessment Methods
Topic I: Site Investigations & Soil Exploration	1, 2, and 12	Report Writing, Field Visits, Theoretical Lectures, Scientific Films, Exploratory Work Teams.	quizzes, Major reports, discussions during lectures, Written Exams, oral exam.
Topic II: - Bearing capacity of shallow foundation	3,4, and 12	Problem Based Learning, Report Writing, Field Visits, Scientific Trips, Theoretical Lectures, Small Group Discussions, Scientific Films, Exploratory Work Teams.	Seminars, Major reports, discussions during lectures. Written Exams, oral exams.
Topic III: - Settlements of shallow foundations	5,6 and 12	Problem Based Learning, Report Writing, Theoretical Lectures, Small Group Discussions, Scientific Films.	Quizzes, discussions during lectures, Written Exams, Home work, oral exams.
Topic IV: - Determination of footing dimensions	7 and 12	Report Writing, Scientific Trips. Theoretical Lectures, Small Group Discussions, and Scientific Films.	Seminars, Major reports, discussions during lectures. Written Exams, oral exams.
Topic V: - Structural design of foundations	8 and 12	Theoretical Lectures, Small Group Discussions,	Seminars, quizzes, discussions during lectures, Written Exams, oral exams.
Topic VI: - Foundations on difficult soils	9,10 and 12	Problem Based Learning, Report Writing, Field Visits, Scientific Trips, Theoretical Lectures, Small Group Discussions, Scientific Films, and, Exploratory Work Teams.	Seminars, quizzes, Major reports, Written Exams, Home work, oral exams.
Topic VII: - Deep foundation	11 and 12	Problem Based Learning, Theoretical Lectures, Small Group Discussions.	quizzes, discussions during lectures. Written Exams, Home work.

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Module Evaluation: -

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment (40%)	Quizzes	4	10% (10)	3,5, 10, 12	LO #, 3,4,5,8,10 and 11
	Assignments & H.W.	5	10% (10)	2,4,6, 9,11	LO # 1-11
	Seminar/ project	1	10% (10)		
	Discussions During Lectures	10	10% (10)	Continuous	ALL
Summative assessment	Midterm Exam (10%)	2 hr	10% (10)	8	LO # 1-7
	Final Exam (50%)	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		



(SWL= SSWL +USWL) توزيع الساعات المجدولة و الغير مجدولة

Activity types	Structured SWL	Un structured SWL	No. of weeks	Time Factor	SWL (hr)
Class	Class Lecturers		15	3	45
Lab.					0
Tutorial			15	1	15
Self-Study		Self-Study	15	1	15
Quizzes		Preparation for the Quizzes	4	3	12
discussions during lectures			0	0	0
Projects / Lab.	Project Work		0	0	0
		Preparation for the Project	3	3	9
Seminar	Presenting a Seminar		1	0	0
		Preparation for the Project			0
Assignments, Home Work		Preparation for the H.W.	5	1	5
Report		Preparation for the Report	3	2	6
Midterm Exam (10%)		Preparation for the Exam.	1	5	5
	Evaluation		0	0	0
Final Exam (50%)		Preparation for the Exam.	1	10	10
	Evaluation		1	3	3
		Total SWL (hr/ Semester)			125
		ECTS			5



"COURSE PORTFOLIO"

Module Information معلومات المادة الدراسية			
Module Title	Water quality control		Module Delivery
Module Type	Core		☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	QWRE3537		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	3	Semester	6
Department	Water Resources Engineering	College	College of Engineering
Module Leader	Ghassan Mohammed Selman	E-mail	ghassan@wrec.uoqasim.edu.iq
Module Leader's Acad. Title	Lecturer	Module Leader's Qualification	Ph.D.
Module Tutor	N.A.	e-mail	N.A.
Peer Reviewer Name	N.A.	e-mail	N.A.
Scientific Committee Approval Date	16/10/2023	Version Number	1.0

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures) + Unstructured SWL (h/w) .

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	63	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4.1
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	62	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	4.2
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		



Relation with other Modules: -

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

COURSE DESCRIPTION:	The purpose of the course is to develop an understanding of water quality criteria, standards, impacts of water pollutants, and treatment methods. It focuses on the causes and effects of water pollution and water quality degradation from a range of sources. Further, it illustrates each unit's processes, functions of the processes in water treatment, and the basic equipment that each process uses. The course covers the basics of water pollutants, their impacts, quality criteria, and standards; covers the basics of water treatment for public water supply; and covers the contemporary issues in water resource management and pollution control strategies.
Module Aims أهداف المادة الدراسية	1. To understand water quality criteria, and standards 2. To comprehend knowledge about sources, cause and impacts of water pollutants 3. To be abreast with physical and chemical methods water treatment
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	After completion of the course, the student shall be able to: 1. Explain the concept of water quality 2. Explain the water cycle 3. Identify physical, chemical, and biological aspects of water quality 4. Assess and quantify quality requirements for use of water 5. Explain and compare pollution sources, loadings, and water characterization 6. Synthesize current technology available for water treatment and research and development status 7. Implement water quality modeling tools 8. Develop an integrated perspective on water resource and water quality management
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. 1. Gilbert M. Masters and Wendell P. Ela (2017) Introduction to Environment



	Engineering and Science. 3rd ed. Pearson, 2. Garg S.K. (2007) Water Supply Engineering, 18th ed, Vol.I, New Delhi, Khanna Publisher. 3. Birde G.S. and Birde J.S. (2004) Water Supply and Sanitary Engineering, 7th ed., New Delhi, Dhanpat Rai Publishing. 4. Joan Rose: Water is Life but Water Quality is Health http://www.iwa-network.org/news/water-islife-but-water-quality-is-health/
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COURSE SCHEDULE:-

Week	hours	Topics Covered	Learning Outcomes
Topic I			
1,2 and 3	6	The purpose of this module is to present an overview on: water quality and health linkage Water Quality as a core, Water quality and health, Potable water quality criteria: desirable vs rejection	1,3 and 4
Topic II			
4,5	4	Water resources and quality management in Iraq. This connects various issues and themes discussed and leads to Water availability; water stress index	1, 2 and 8
Topic III			
6,7	4	the water cycle and quality requirements for use of water, pollution sources,	2,4 and 5
Topic IV			
8 to 15	14	Water treatment physical and chemical methods water treatment design examples	6,7 and 8
Final Exam			



Learning Outcomes and Assessment Methods

Topics Covered	Learning Outcomes	Strategies for Achieving Outcomes	Assessment Methods
Topic I: The purpose of this module is to present an overview on: water quality and health linkage Water Quality as a core, Water quality and health, Potable water quality criteria: desirable vs rejection	1,3 and 4	Problem Based Learning, Critical thinking questions, Theoretical Lectures	quizzes, HomeWorks , discussions during lectures,
Topic II: - Water resources and quality management in Iraq. This connects various issues and themes discussed and leads to Water availability; water stress index	1, 2 and 8	Problem Based Learning, Theoretical Lectures	quizzes, HomeWorks, discussions during lectures,
Topic III: - the water cycle and quality requirements for use of water, pollution sources,	1,2	Critical thinking questions, Theoretical Lectures, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures,
Topic IV: - Water treatment physical and chemical methods water treatment design examples	4,5	Critical thinking questions, Theoretical Lectures, Small Group Discussions,	quizzes, HomeWorks, discussions during lectures,

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Module Evaluation:-

Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment (40%)	Quizzes	4	20% (20)	5, 10	ALL
	Assignments & H.W.	2	10% (10)	2 ,12	ALL
	Discussions During Lectures	5	10% (10)	Continuous	ALL
Summative assessment (60%)	Midterm Exam (10%)	2hr	10% (10)	8	ALL
	Final Exam (50%)	3hr	50% (50)	16	ALL
Total assessment			100% (100 Marks)		



(SWL= SSWL +USWL) توزيع الساعات المجدولة و الغير مجدولة

Activity types	Structured SWL	Un structured USWL	No. of weeks	Time Factor	SWL (hr)
Class	Class Lecturers		15	2	30
Lab.			15	2	30
Tutorial					
Self Study		Self Study	15	1	15
Quizzes		Preparation for the Quizzes	4	3	12
discussions during lectures			5	1	5
Projects / Lab.	Project Work		3	1	3
		Preparation for the Project	1	3	3
Seminar	Presenting a Seminar		1	4	4
		Preparation for the Project			
Assignments, Homework		Preparation for the H.W.	1	2	2
Report		Preparation for the Report	0	0	0
Midterm Exam (10%)		Preparation for the Exam.	1	6	6
	Evaluation				
Final Exam (50%)		Preparation for the Exam.	1	12	12
	Evaluation		1	3	3
		Total SWL (hr/ Semester)			125
		ECTS			5

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Engineering Economic and Management		Module Delivery
Module Type	Support		☒ Theory ☐ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar
Module Code	QWRE3438		
ECTS Credits	4		
SWL (hr/sem)	100		
Module Level	3	Semester of Delivery	6
Administering Department	Water Resources Management	College	Engineering
Module Leader	Haider Zwain	e-mail	haider.zwain@wrec.uoqasim.edu.iq
Module Leader's Acad. Title	Associate Professor	Module Leader's Qualification	Ph.D.
Module Tutor	None	e-mail	None
Peer Reviewer Name	None	e-mail	None
Scientific Committee Approval Date	05/011/2023	Version Number	1.0

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures) + Unstructured SWL (h/w) .

Student Workload (SWL)			
الحمل الدراسي للطالب			
Structured SWL (h/sem)	٤٨	Structured SWL (h/w)	3.2
الحمل الدراسي المنتظم للطالب خلال الفصل		الحمل الدراسي المنتظم للطالب أسبوعيا	
Unstructured SWL (h/sem)	٥٢	Unstructured SWL (h/w)	3.5
الحمل الدراسي غير المنتظم للطالب خلال الفصل		الحمل الدراسي غير المنتظم للطالب أسبوعيا	
Total SWL (h/sem)	١٠٠		
الحمل الدراسي الكلي للطالب خلال الفصل			

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

Module Aims, Learning Outcomes and Indicative Contents أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية	
Module Aims أهداف المادة الدراسية	The objectives of these courses are to introduce engineering management & economy to civil engineering undergraduate students; in addition to enable, the students to possess the necessary skills to work as residential engineer or executing engineer in construction projects, beside function ethically in their professional civil engineering roles
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	• An ability to apply knowledge of mathematics, science and engineering • An ability to design a system, component, or process to meet desired needs within realistic
Indicative Contents المحتويات الإرشادية	Indicative content includes the following: Part A: Introduction to engineering management [8 hrs] Part B: Relationship between project achieving team and project phases, planning techniques [12 hrs] Part C: general limitation for engineering civil work in Iraq,[21 hrs]. Part D: method of tendering [3 hrs] Part E: Project for Estimation [3 hrs]

Learning and Teaching Strategies استراتيجيات التعلم والتعليم	
Strategies	1) Learning Technologies on Campus using data show or TV screen. 2) White board. 3) Hand out lecture notes. 4) Hand out some kinds of pictures related to specific topics.

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	4
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.466
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

Module Evaluation تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	15% (15)	5 , 8	LO # 2, 3,4 and 6, 7
	Assignments	2	10% (10)	6, 12	LO # 3, 4 , 5 and 9, 10 and 11
	Projects / Lab.	1	10% (10)	Continuous	
	Report	1	5% (5)	13	Continuous
Summative assessment	Midterm Exam	2 hr	10% (10)	10	LO # 1-9
	Final Exam	3hr	50% (50)	16 or 17	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus) المنهاج الاسبوعي النظري	
	Material Covered
Week 1	Welcome to this course, syllabus, and expectations. Textbook. Distribution of data, tabular presentation of data.
Week 2	Introduction to engineering management

Week 3	Relationship between project achieving team and project phases,
Week 4	planning techniques
Week 5	general limitation for engineering civil work in Iraq, engineering contract,
Week 6	project execution approaches, method of tendering
Week 7	Planning for engineering projects
Week 8	Types of Estimation
Week 9	Methods for calculation of construction materials
Week 10	Quantity tables and measurements
Week 11	Methods for calculation of quantity and volumes of materials
Week 12	Time – cost relationship, operation research, linear programming and its application, types of costs.
Week 13	Pricing of Quantity
Week 14	Technical specification
Week 15	Project for Estimation
Week 16	Preparatory week before the final Exam

Delivery Plan (Weekly Lab. Syllabus) المنهاج الاسبوعي للمختبر	
	Material Covered
Week 1	None
Week 2	
Week 3	
Week 4	
Week 5	
Week 6	
Week 7	
Week 8	Mid-term Exam
Week 9	
Week 10	
Week 11	
Week 12	
Week 13	
Week 14	

Week 15	
Week 16	

Learning and Teaching Resources مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	- Equipment and methods of construction / translated by Dr. Mohammad Ayub Al-Izzi / publications of University of Technology, 1985	Yes
Recommended Texts	- Cost analyzing guideline for building and construction / Ministry of Construction and Housing, 2014	No
Websites		

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

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



"COURSE PORTFOLIO"

Module Information معلومات المادة الدراسية					
Module Title	Numerical Analysis			Module Delivery	
Module Type	Basic			☒ Theory ☐ Lecture ☒ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	QWRE3439				
ECTS Credits	4				
SWL (hr/sem)	100				
Module Level		3	Semester		6
Department		Water Resources Engineering	College	College of Engineering	
Module Leader	NOORA SALIM ALWAN		E-mail	Noora.salim@wrec.uoqasim.edu.iq	
Module Leader's Acad. Title		Lecture	Module Leader's Qualification		Ph.D.
Module Tutor	N.A.		e-mail	N.A.	
Peer Reviewer Name		N.A.	e-mail	N.A.	
Scientific Committee Approval Date		01/06/2023	Version Number	1.0	

Student Workload (SWL): Structured SWL (h/w) (Two contact hours of lectures) + Unstructured SWL (h/w) .

Student Workload (SWL) الحمل الدراسي للطالب			
Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعياً	3.2
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	52	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	3.5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	100		

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Relation with other Modules:-

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

COURSE DESCRIPTION:	Study numerical engineering analysis to have the ability to solve engineering problems numerically. Numerical analysis course provides the ability of data analysis, obtained the solutions of difficult equations and differential equations which cannot solve exactly. This course improved and developed student's ability to get the numerical solution of mathematical engineering problems.
Module Aims أهداف المادة الدراسية	In this course the student will have an ability to identify, formulate, and solve engineering problems numerically.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	1-Study the method of transform the discontinue function to continue function using Fourier series with applications. 2- Obtain the ability to calculate the roots of difficult equation numerically. 3- Obtain the ability of data analysis using interpolation and inverse interpolation. 4- Obtain the ability to fit data numerically using curve fitting. 5- Obtain the ability to calculate integration of difficult functions numerically. 6- Obtain the ability to solve linear simulations equations using direct and indirect methods. 7- Obtain the ability to solve ordinary D.E. numerically. Obtain the ability to solve boundary value problems using finite difference with applications. Improved and development student experiences in advance engineering mathematics.
Indicative Contents المحتويات الإرشادية	

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COURSE SCHEDULE:-

Week	hour	Topics Covered	Learning Outcomes	Notes
1,2	4	General Fourier series	1,9	
3,4	2	Engineering process concepts	1,2	
5,6,7	4	Drawing engineering projections.	1,2 and 3	
8,9	6	Isometric method	1,2,3 and 10	
10,11,12	2	Sections	8	
13,14	4	Dimensional method	9,10	
15	4	Actual plans for buildings and equipment	All (1 to 8)	

**Learning Outcomes and Assessment Methods for " Water Resources Engineering
 " Course.**

Week	hours	Topics Covered	Learning Outcomes
Topic I			
1	4	<i>General Fourier series</i>	1,9
Topic II			
2	3	<i>Roots of equations using bisection method and false position method</i>	2, 9
3	3	<i>Roots of equations using Newton-Raphson method, Interpolation using Newton interpolation method</i>	2,3,9
4	3	<i>Interpolation using Lagrange interpolation method and its inverse, Curve fitting</i>	3,4,9
5	3	<i>Numerical integration by rectangles method, trapezoidal rule</i>	5,9
6	3	<i>Numerical integration by Gauss-quadrature method</i>	5,9
7	3	<i>Linear simulation equations, Gauss-elimination method</i>	6,9
8	3	<i>Linear simulation equations, Cholski method</i>	6,9
9	3	<i>Linear simulation equations, Gauss-Sidel method, Jacobi method</i>	6,9



10	3	<i>Numerical solution of ordinary D.E., Euler method, modified Euler method</i>	7,9
11	3	<i>Numerical solution of ordinary D.E., Runge-Kutta method, Higher order D.E.</i>	7,9
12	3	<i>Solution of ordinary D.E. using finite difference method</i>	8,9
13	3	<i>Applications of ordinary D.E. (Boundary value problems) using finite difference</i>	8,9
14	3	<i>Applications of ordinary D.E. (Boundary value problems) using finite difference</i>	8,9
15	3	<i>Roots of equations using bisection method and false position method</i>	2, 9
Final Exam			

Learning Outcomes and Assessment Methods for "Engineering Analysis" Course.

Topics Covered	Learning Outcomes	ABET Outcomes	Assessment Methods
General Fourier series	1,9	A, c, e, h,k	quizzes, Major reports, discussions during lectures, Written Exams, oral exams.
Half-range expansions with applications	1, 9	A, c, e, h,k	Seminars, Major reports, discussions during lectures. Written Exams, oral exams.
Roots of equations using bisection method and false position method	2, 9	A, c, e, h,k	Quizzes, discussions during lectures, Written Exams, Home work, oral exams.
Roots of equations using Newton-Raphson method, Interpolation using Newton interpolation method	2,3,9	A, c, e, h,k	Seminars, Major reports, discussions during lectures. Written Exams, oral exams.
Interpolation using Lagrange interpolation method and its inverse, Curve fitting	3,4,9	A, c, e, h,k	Seminars, quizzes, discussions during lectures, Written Exams, oral exams.
Numerical integration by rectangles method, trapezoidal rule	5,9	A, c, e, h,k	Seminars, quizzes, Major reports, Written Exams, Home work, oral exams.
Numerical integration by Gauss-quadrature method	5,9	A, c, e,	Seminars, Major reports, discussions during lectures.

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		h,k	Written Exams, Home work, oral exams.
Linear simulation equations, Gauss-elimination method	6,9	A, c, e, h,k	quizzes, Major reports, discussions during lectures, Written Exams, Home work, oral exams.
Linear simulation equations, Choliski method	6,9	A, c, e, h,k	quizzes, discussions during lectures. Written Exams, Home work.
Linear simulation equations, Gauss-Sidel method, Jacobi method	6,9	A, c, e, h,k	quizzes, discussions during lectures. Written Exams, Home work
Numerical solution of ordinary D.E., Euler method, modified Euler method	7,9	A, c, e, h,k	Seminars, quizzes, Major reports, Written Exams, Home work, oral exams.
Numerical solution of ordinary D.E., Runge-Kutta method, Higher order D.E.	7,9	A, c, e, h,k	Seminars, Major reports, discussions during lectures. Written Exams, Home work, oral exams.
Solution of ordinary D.E. using finite difference method	8,9	A, c, e, h,k	quizzes, Major reports, discussions during lectures, Written Exams, Home work, oral exams.
Applications of ordinary D.E. (Boundary value problems) using finite difference	8,9	A, c, e, h,k	quizzes, discussions during lectures. Written Exams, Home work.
Applications of ordinary D.E. (Boundary value problems) using finite difference	8,9	A,c,e,h,k	quizzes, Major reports, discussions during lectures, Written Exams, Home work, oral exams.

Module Evaluation:-

Module Evaluation				
تقييم المادة الدراسية				
	Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome

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Formative assessment (40%)	Quizzes	2	10% (10)	4, 13	LO # 1,4,5,6 and 11
	Assignments & H.W.	13	20% (20)	1 to 14	LO # All
	Discussions During Lectures	10	10% (10)	Continuous	ALL
Summative assessment	Midterm Exam (10%)	2 hr	10% (10)	8	
	Final Exam (50%)	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

(SWL= SSWL +USWL) توزيع الساعات المجدولة و الغير مجدولة

Activity types	Structured SWL	Un structured SWL	No. of weeks	Time Factor	SWL (hr)
Class	Class Lecturers				
Lab.			15	3	45
Tutorial					
Self-Study		Self-Study	30	1	30
Quizzes		Preparation for the Quizzes	1	1	2
discussions during lectures			8	1	8
Assignments, Home Work		Preparation for the H.W.	5	1	5
Midterm Exam (10%)		Preparation for the Exam.	1	5	5
	Evaluation		0	0	
Final Exam (50%)		Preparation for the Exam.	1	5	5
	Evaluation				
		Total SWL (hr/ Semester)			100
		ECTS			6

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