

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information				
معلومات المادة الدراسية				
Module Title	Analytical Mathematics		Module Delivery	
Module Type	Basic		☒ Theory ☒ Lecture ☐ Lab ☐ Tutorial ☐ Practical ☐ Seminar	
Module Code	MATH220			
ECTS Credits	6			
SWL (hr/sem)	150			
Module Level	2	Semester of Delivery	4	
Administering Department	Biomedical engineering		College	College of Engineering
Module Leader	Ali akbar wathiq		e-mail	Ali akbar@gmail.com
Module Leader's Acad. Title	Lecturer		Module Leader's Qualification	Msc.
Module Tutor	Ali akbar wathiq		e-mail	Ali akbar@gmail.com
Peer Reviewer Name			e-mail	
Scientific Committee Approval Date			Version Number	1.0

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

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Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Aims أهداف المادة الدراسية	The student will study mathematical theories and application. On completion of this course the student will be able to: 1. Solve problems by vectors 2. Solve problems of vector fields 3. Classify and solve separable, linear and exact differential equations. 4. Set a mathematical model for practical problems like mechanical vibrations or simple electric circuit RLC		
Module Learning Outcomes مخرجات التعلم للمادة الدراسية 	Knowledge	A2	A2.1 Identify the fundamental concepts of vector calculus, matrices, determinants, techniques of integration, and first-order differential equations. A2.2 Explain the principles of dot product, cross product, matrix operations, integration techniques, and the classification of first-order differential equations. A2.3 Apply matrix methods, integration techniques, and first-order differential equation methods to solve mathematical and engineering problems.
		B1	B1.1 Communicate effectively B1.2 Students will have developed problem solving and reasoning abilities that will serve them well in many important petroleum engineering aspects as well as their lives.
	Skills	B2	B2.1 Communicate effectively – graphically with a range of audiences using contemporary tools. B2.2 Communicate verbally and in writing with a range of audiences using contemporary tools.
		C2	C2.1 Recognize professional and ethical responsibility. C2.2 Adhere and respect diversity.
Indicative Contents المحتويات الإرشادية	Indicative content includes the following. Part A - Vectors Vectors in 2-Space and 3-Space, Inner Product (Dot Product), Vector Product (Cross Product), Vector and Scalar Functions and Fields, Gradient of a Scalar Field. Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field. [15 hrs.] Vector Integral Calculus. Integral Theorems, Line Integrals, Path Independence of Line Integrals, Green's Theorem in the Plane, Surfaces for Surface Integrals, Surface Integrals, Triple Integrals. Divergence Theorem of Gauss, . [20 hrs.] Part B - First-Order Differential Equations		

	Solution Curves Without a Solution, Direction Fields, Autonomous first-Order DEs, Separable Equations, Linear Equations, Exact Equations , Solutions by Substitutions , A Numerical Method , Linear Models , Nonlinear Models , Modeling with Systems of First-Order DEs , [20 hrs.] Part C - Higher-Order Differential Equations Theory of Linear Equations , Initial-Value and Boundary-Value Problems , Homogeneous Equations , Nonhomogeneous Equations , Reduction of Order , Homogeneous Linear Equations with Constant Coefficients , Undetermined Coefficients , Variation of Parameters , Cauchy–Euler Equations , Linear Models: Initial-Value Problems Spring/Mass Systems: Free Undamped Motion , Spring/Mass Systems, Free Damped Motion, Spring/Mass Systems: Driven Motion , Series Circuit Analogue , Linear Models: Boundary-Value Problems , Green’s Functions , Initial-Value Problems . [15 hrs.].
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Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Assessment is based on hand-in assignments, written exam, Quizzes.
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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	1.92
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	72	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعياً	2.08
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	150		



Module Evaluation					
تقييم المادة الدراسية					
		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (5)	5, 10	LO #1, 2, 3,4, and 5
	Online Assignments	2	10% (5)	3,8	All
	On site Assignments	2	10% (5)	4,9	
	Seminars	1	5% (5)	3,4, ,6,7,8,9	
	reports	1	5% (5)	12	
Summative assessment	Midterm Exam	2 hr	10% (10)	13	All
	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)		
المنهاج الاسبوعي النظري		
	Material Covered	LOs
Week 1	-Vector Calculus - Inner Product (Dot Product) - Vector Product (Cross Product)	A2-1, B1.1, C1-1
Week 2	-Metrices and determinant -Cramer's rule	A2-2, B2.1, C1-3
Week 3	-Singular matrices -Inverse of matrices	A2-1, A3-1, C1-1
Week 4	-Techniques of integration -Examples	A2-1, A3-1
Week 5	-Integration by part -Trigonometric integral	A2
Week 6	Trigonometric substitution -Examples	A2-1, A2-3, A2-2, B2.2
Week 7	-integration of rational function	A2-1, A3-1, C1-2
Week 8	Improper integral -Examples	A2-1, A2-3, A3-2
Week 9	The substitution of $z = \tan x$ -Examples	A2-2, B2.2, C1-3



Week 10	Ordinary Differential Equations of the First Order -Classification of Differential Equations	A2-2, B2.1, C1-1
Week 11	-Separable First-Order Equations - Homogeneous First-Order Equations	A2-1, A2-3, A3-2, B1.2,
Week 12	MID EXAM	A2
Week 13	-Exact First-Order Equations -Integrating Factors for First-Order Equations	A2-2, A3-2, B1.1
Week 14	-Second-Order Equations of Reducible Order -Applications of First-Order Differential Equations	A2-2, A3-2, C1-2
Week 15	Linear Differential Equations	A2-2, A3-1, B2.1, C1-3
Week 16	Preparatory week before the final Exam	A2

Delivery Plan (Weekly Lab. Syllabus)

المنهاج الاسبوعي للمختبر

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



Learning and Teaching Resources		
مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	Advanced Engineering Mathematics 9th ed. / Kreysziq	Yes
Recommended Texts	Advanced Engineering Mathematics 6th ed./ Zill	No
Websites	https://eng.alayen.edu.iq//colleges/e/42	

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.				

