

MODULE DESCRIPTION

Module Information				
Module Title	Mathematics III		Module Delivery	
Module Type	Basic		☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical ☐ Seminar	
Module Code	PE213			
ECTS Credits	5			
SWL (hr/sem)	125 H/Sem.			
Module Level		2		
Administering Department		Petroleum Engineering	College	College of Engineering
Module Leader		Hussam wheed maktooff	e-mail	H564127@gmail.com
Module Leader's Acad. Title		Assistant lecture	Module Leader's Qualification	
			M.sc	
Module Tutor		Hussam wheed maktooff	e-mail	H564127@gmail.com
Peer Reviewer Name		Hasnaa M.EL-Arwash	e-mail	Hasnaa.Mohammed@alayen.edu.iq
Scientific Committee Approval Date		2025/10/5	Version Number	1.0

Relation with other Modules			
Prerequisite module	Mathematics II (PE123)	Semester	2
Co-requisites module	Mathematics IV (PE223)	Semester	4

Module Aims, Learning Outcomes and Indicative Contents	
Module Objectives	1. Understand the reason behind studying mathematical engineering and its main applications. 2. Sequences, The Ratio and Root Tests , Alternating Series and Conditional Convergence , Power Series ,Taylor and Maclaurin Series , Convergence of Taylor Series ,The Applications of Taylor Series 3. Parametrizations of Plane Curves , Calculus with Parametric Curves , Polar Coordinates 4. Vectors, The Dot Product , The Cross Product , Lines and Planes in Space, Cylinders and Quadric Surfaces, Curves in Space and Their Tangents Integrals of 5. Functions of Several Variables, Limits and Continuity in Higher Dimensions ,



	Partial Derivatives , The Chain Rule , Directional Derivatives and Gradient Vectors , Tangent Planes and Differentials , Extreme Values and Saddle Points , Lagrange Multipliers , Taylor's Formula for Two Variables , Partial Derivatives with Constrained Variables Functions of Several Variables, Limits and Continuity in Higher Dimensions , Partial Derivatives , The Chain Rule , Directional Derivatives and Gradient Vectors , Tangent Planes and Differentials , Extreme Values and Saddle Points , Lagrange Multipliers , Taylor's Formula for Two Variables , Partial Derivatives with Constrained Variables Vector Functions.		
Module Learning Outcomes	Knowledge	A2	A2.1 understanding the basics of mathematics theories, methods and techniques. It also intends to introduce the applications of petroleum engineering field applications. A2.2 Solving equations, finding solutions to algebraic and differential equations. A2.3 Classification of geometric shapes, as well as functions whether they are linear, quadratic, or exponential, trigonometric functions, and linear, differential, and algebraic equations.
	Skills	B1	B1.1 Function efficiently as an individual B1.2 Function as a member of multidisciplinary and multicultural teams
		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.
	Ethics	C2	C2.1 Recognize professional and ethical responsibility. C2.2 Adhere and respect diversity.
Indicative Contents	Indicative content includes the following. Unit 1: Introduction, Basics of mathematics, Understand the reason behind studying mathematical engineering and its main applications. [6 hours]. Unit 2: Sequences, Infinite Series, The Integral Test , Comparison Tests , Absolute Convergence; The Ratio and Root Tests , Alternating Series and Conditional Convergence , Power Series ,Taylor and Maclaurin Series , Convergence of Taylor Series ,The Applications of Taylor Series [6 hours]. Unit 3: Parameterizations of Plane Curves, Calculus with Parametric Curves, Polar Coordinates, Contents, Graphing Polar Coordinate Equations, Areas and Lengths in Polar Coordinates. [4 hours]. Unit 4: Three-Dimensional Coordinate Systems ,Vectors , The Dot Product , The Cross Product , Lines and Planes in Space Cylinders and Quadric Surfaces, Curves in Space and Their Tangents Integrals of Vector Functions; Projectile Motion, Arc Length in SpaceThree-Dimensional		

	Coordinate Systems, Vectors, The Dot Product, The Cross Product, Lines and Planes in Space Cylinders and Quadric Surfaces, Curves in Space and Their Tangents Integrals of Vector Functions; Projectile Motion, Arc Length in Space [6 hours]. Unit 5: Functions of Several Variables, Limits and Continuity in Higher Dimensions , Partial Derivatives , The Chain Rule , Directional Derivatives and Gradient Vectors , Tangent Planes and Differentials , Extreme Values and Saddle Points , Lagrange Multipliers , Taylor's Formula for Two Variables , Partial Derivatives with Constrained Variables Functions of Several Variables, Limits and Continuity in Higher Dimensions , Partial Derivatives , The Chain Rule , Directional Derivatives and Gradient Vectors , Tangent Planes and Differentials , Extreme Values and Saddle Points , Lagrange Multipliers , Taylor's Formula for Two Variables , Partial Derivatives with Constrained Variables [6 hours].
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Learning and Teaching Strategies

Strategies	• Presentation • Interactive learning • Discussions • Brainstorming • Group Solving Problems • Problem-Based Learning • Self-learning
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Student Workload (SWL) for 15 weeks

Structured SWL (h/sem)	77	Structured SWL (h/w)	5.13
Unstructured SWL (h/sem)	48	Unstructured SWL (h/w)	3.2
Total SWL (h/sem)	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Quizzes	2	10% (10)	5 and 10	A2
	Interaction within the class	All	10% (10)	All	A2
	Assignments	2	10% (10)	4 and 10	A2,B1,B2
	Projects / Lab.				
	Report	1	10% (10)	13	A2
Summative	Midterm Exam	1hr	10% (10)	14	A2,B1

assessment	Final Exam	3hr	50% (50)	15	A2
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)		
المنهاج الاسبوعي النظري		
	Material Covered	LOs
Week 1	Introduction	A2, B1, B2, C1
Week 2	Basics of mathematics	A2, B1, B2, C2
Week 3	Understand the reason behind studying mathematical engineering and its main applications.	A2, B1, B2, C1
Week 4,5,6	Sequences, Infinite Series, The Integral Test , Comparison Tests , Absolute Convergence; The Ratio and Root Tests , Alternating Series and Conditional Convergence , Power Series ,Taylor and Maclaurin Series , Convergence of Taylor Series ,The Applications of Taylor Series	A2, B1, B2, C1
Week 7,8	Parametrizations of Plane Curves, Calculus with Parametric Curves, Polar Coordinates, Contents, Graphing Polar Coordinate Equations, Areas and Lengths in Polar Coordinates.	A2, B1, B2, C1
Week 9,10,11	Three-Dimensional Coordinate Systems ,Vectors , The Dot Product , The Cross Product , Lines and Planes in Space, Cylinders and Quadric Surfaces, Curves in Space and Their Tangents Integrals of Vector Functions; Projectile Motion ,Arc Length in Space Three-Dimensional Coordinate Systems ,Vectors , The Dot Product , The Cross Product , Lines and Planes in Space, Cylinders and Quadric Surfaces, Curves in Space and Their Tangents Integrals of Vector Functions; Projectile Motion ,Arc Length in Space	A2, B1, B2, C1
Week 12,13,14	Functions of Several Variables, Limits and Continuity in Higher Dimensions , Partial Derivatives , The Chain Rule , Directional Derivatives and Gradient Vectors , Tangent Planes and Differentials , Extreme Values and Saddle Points , Lagrange Multipliers , Taylor's Formula for Two Variables , Partial Derivatives with Constrained Variables Functions of Several Variables, Limits and Continuity in Higher Dimensions , Partial Derivatives , The Chain Rule , Directional Derivatives and Gradient Vectors , Tangent Planes and Differentials , Extreme Values and Saddle Points , Lagrange Multipliers , Taylor's Formula for Two Variables , Partial Derivatives with Constrained Variables.	A2, B1, B2, C1
Week 15	Preparation and Help Session for the Final Exam	A2
Learning and Teaching Resources		

مصادر التعلم والتدريس		
	Text	Available in the Library?
Required Texts	1. Jerrold Marsden and Alan Weinstein, Calculus II second edition 1985. 2. George B. Thomas, Thomas' calculus, thirteen editions, 2014 Jerrold Marsden and Alan Weinstein, Calculus II second edition 1985.	Yes
Recommended Texts		
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.				