

MODULE DESCRIPTION FORM

نموذج وصف المادة الدراسية

Module Information			
معلومات المادة الدراسية			
Module Title	Mathematics/IV		Module Delivery
Module Type	Core		☒ Theory ☒ Lecture ☐ Lab ☒ Tutorial ☐ Practical Seminar
Module Code	PE 223		
ECTS Credits	5		
SWL (hr/sem)	125		
Module Level	Two	Semester of Delivery	2nd
Administering Department	PE	College	CE
Module Leader	Mohammed Ahmed Mohammed	e-mail	mohammed.ahmed.m@alnaji-uni.edu.iq
Module Leader's Acad. Title	Assistant Lecturer	Module Leader's Qualification	M. Sc
Module Tutor		e-mail	
Peer Reviewer Name		e-mail	
Scientific Committee Approval Date		Version Number	1.0

Relation with other Modules			
العلاقة مع المواد الدراسية الأخرى			
Prerequisite module	PE 114 and PE 123	Semester	First and Second
Co-requisites module		Semester	

Module Aims, Learning Outcomes and Indicative Contents

أهداف المادة الدراسية ونتائج التعلم والمحتويات الإرشادية

Module Objectives أهداف المادة الدراسية	This module is an important module that should be taken by students in mathematics, engineering, and natural science. It represents the Infinite Series, which give students precise ways to express many numbers and functions as arithmetic sums with infinitely many terms. Partial derivatives and multiple integrals are then covered in this module. An introduction to the order and degree of ordinary differential equations, and types and solutions of 1st order differential equations are also presented. • Enable the student to know many types of infinite sequences and infinite series and which of them are converged or diverged. • Understand the representation of functions as power series and study their radius and interval of convergence. • Learn how infinite series are used in approximation of functions, solving differential equations, and in numerical methods (e.g., Taylor series expansion). • Learn how to deal with functions of more than one variable and understand how changes in each variable affect the function. • Learn how to interpret the meaning of partial derivatives in real-world contexts, such as in physics (rate of change of temperature, pressure, etc.). • Learn the definition of a double integral and understand how it extends the concept of a single integral to two dimensions. • Understand how to set up and evaluate double integrals over rectangular and more general regions (non-rectangular regions) in the xy-plane. • Introduce the order and degree of differential equations and solving 1st order DE using different methods.
Module Learning Outcomes مخرجات التعلم للمادة الدراسية	At the end of this module, the student will be able to: 1. Learn the infinite sequences and series. 2. Learn how the integral and comparison tests can be applied. 3. Learn how to implement the ratio and root tests. 4. Learn how to solve equations using the Power, Taylor, and Maclaurin series. 5. Learn how partial derivatives are defined and calculated by applying the rules of differentiating functions of a single variable. 6. Learn how to apply the double and iterated integrals over general and rectangular regions. 7. Solve different types of first order ordinary differential equations. 8. Work in groups and function on multi-disciplinary teams. 9. Understand professional, social and ethical responsibilities. 10. Communicate effectively 11. 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.
Indicative Contents المحتويات الإرشادية	Infinite Sequences and Series • 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 Binomial Series and Applications of Taylor Series Partial Derivatives • Functions of Several Variables • Limits and Continuity in Higher Dimensions • 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 Multiple Integrals • Double Integral • Double and Iterated Integrals over Rectangles • Double Integrals over General Regions • Area by Double Integration • Double Integrals in Polar Form First-Order Differential Equations • Introduction to Ordinary and Partial Differential Equations (order and degree) • Types and Solutions of 1st Order LDE

Learning and Teaching Strategies

استراتيجيات التعلم والتعليم

Strategies	Lectures: during the week, the theoretical lectures will be presented throughout the semester; the discussion of practical work within the lab will be organized and illustrated with activities. Assignments: after the lectures, the assignment will be explained and given to students. It is expected to be done on a weekly basis. Quizzes: the contents of each lecture will be discussed during class for open questions and answers to make sure every student will participate and be active. Practical Discussion: during the practical session, the students will combine as partners and form a group to discuss their class learning and open tutorials on the topics. In class brainstorming sessions: provide students with enough sources and background knowledge briefly within the topics during class to top up their challenge packs to be more active
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Student Workload (SWL)

الحمل الدراسي للطالب محسوب لـ ١٥ اسبوعا

Structured SWL (h/sem) الحمل الدراسي المنتظم للطالب خلال الفصل	48	Structured SWL (h/w) الحمل الدراسي المنتظم للطالب أسبوعيا	3
Unstructured SWL (h/sem) الحمل الدراسي غير المنتظم للطالب خلال الفصل	77	Unstructured SWL (h/w) الحمل الدراسي غير المنتظم للطالب أسبوعيا	5
Total SWL (h/sem) الحمل الدراسي الكلي للطالب خلال الفصل	125		

Module Evaluation

تقييم المادة الدراسية

		Time/Number	Weight (Marks)	Week Due	Relevant Learning Outcome
Formative assessment	Assignments	4	10% (10)	3, 6, 10, and 13	All
	Quizzes	3	30% (30)	4, 11, and 14	All
Summative	Midterm Exam	1hr	10% (10)	7	LO #1 - #5; LO #8 - #11

assessment	Final Exam	3hr	50% (50)	16	All
Total assessment			100% (100 Marks)		

Delivery Plan (Weekly Syllabus)

المنهاج الاسبوعي النظري

	Material Covered
Week 1	Infinite Sequences and Series - Sequences - Infinite Series
Week 2	Infinite Sequences and Series - The Integral Test - Comparison Tests
Week 3	Infinite Sequences and Series - Absolute Convergence; The Ratio and Root Tests - Alternating Series and Conditional Convergence
Week 4	Infinite Sequences and Series - Power Series - Taylor and Maclaurin Series
Week 5	Infinite Sequences and Series - Convergence of Taylor Series - The Binomial Series and Applications of Taylor Series
Week 6	Partial Derivatives - Functions of Several Variables - Limits and Continuity in Higher Dimensions
Week 7	Partial Derivatives - The Chain Rule - Directional Derivatives and Gradient Vectors
Week 8	Partial Derivatives - Tangent Planes and Differentials - Extreme Values and Saddle Points
Week 9	Partial Derivatives - Lagrange Multipliers - Taylor's Formula for Two Variables - Partial Derivatives with Constrained Variables
Week 10	Multiple Integrals - Double Integral - Double and Iterated Integrals over Rectangles
Week 11	Multiple Integrals Double Integrals over General Regions
Week 12	Multiple Integrals Area by Double Integration

Week 13	Multiple Integrals Double Integrals in Polar Form
Week 14	First-Order Differential Equations - Introduction to Ordinary and Partial Differential Equations - Order and Degree of Ordinary Differential Equations
Week 15	First-Order Differential Equations Types and Solutions of 1st Order LDE

Learning and Teaching Resources

مصادر التعلم والتدريس

	Text	Available in the Library?
Required Text and Books	"Thomas Calculus" G. Thomas, M. Weir, et al., 13th edition, 2014.	Yes
Recommended Texts		
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.