

Faculty of Engineering & Technology

Differentiation with Applications and Algebra (Math 1)

Information :

Course Code : MTH 111

Level : Undergraduate

Course Hours : 3.00- Hours

Department : Faculty of Engineering & Technology

Instructor Information :

Title	Name	Office hours
Lecturer	Soliman Abdulkarim Alkhatib	7
Assistant Lecturer	Doaa Nabil Sayed Mohamed Elsayed Khodair	10
Assistant Lecturer	Basma Magdy Ahmed Mohamed	12
Teaching Assistant	Ahmed Elsayed Abdellatif Ibrahim Bedeir	
Teaching Assistant	Mariam Mohamed Kamal Abdelaziz	

Area Of Study :

• Demonstrate a sound understanding of the concepts of differential calculus and linear algebra.
 • Develop mathematical skills for the rules of differentiation to the solution of engineering problems.
 Algebra: Definitions and properties of determinant and matrices; System of Linear equations, Eigen values and Eigenvectors of a matrix with applications, Gauss elimination method. Theory of nonlinear equations Numerical methods: Iteration methods, Newton's and modified Newton's method, Secant method.

Description :

Concepts of a function, limits, continuity, and differentiation. Rules of Differentiation. Differentiation of algebraic and transcendental functions and their Inverses. Application of derivatives. Taylor and Maclaurin expansion. Extrema of a function. Asymptote lines, Curve Sketching. Higher derivatives and Leibnitz Rule. Indeterminate forms and L'Hopital's rule. Algebra of determinants and matrices, Solution of linear systems. Gauss - Jordan Method, Iterative Methods. Eigenvalues and Eigenvectors.

Course outcomes :

a. Knowledge and Understanding: :

1 -	Explain the concepts of function, limit, properties of functions, continuity, inverse of algebraic functions, rules of differentiation, differentiation of algebraic and transcendental functions with inverses, and curve sketching.
2 -	Explain the higher derivatives of functions, Leibnitz rule, curve sketching, and Taylor and Maclaurien series & polynomials with absolute error estimation.
3 -	Identify various forms of indeterminate quantities, and L'Hopital rule application for certain types of Indeterminate forms.
4 -	Recognize determinants, matrix algebra, and direct and iterative methods for the solution of algebraic linear systems.
5 -	Illustrate the eigenvalues and the corresponding eigenvectors of a matrix.

b. Intellectual Skills: :

1 -	Analyze the theorems, concepts, methods, and rules of differentiation for algebraic and transcendental functions.
2 -	Apply Taylor theorem for the approximation of functions, and L'Hopital rule for Indeterminate quantities evaluations.
3 -	Apply matrix algebra, inverse matrix, reduced matrix, to the solution of linear system of algebraic equations.
4 -	Solve linear system of equations (homogeneous and non-homogeneous) by using Gauss - Jordan method, and other direct methods, or by any convenient iterative methods.
5 -	Apply matrix algebra in finding eigenvalues and eigenvectors.

Course Topic And Contents :

Topic	No. of hours	Lecture	Tutorial / Practical
Concept of a function, limits, properties, Continuity, & Differentiation.	5	3	2
Rules of Differentiation. Chain rule, Implicit Differentiation. Differentiation of parametric functions.	5	3	2
Transcendental functions and differentiation. Trigonometric and Inverse Trigonometric Functions. Exponential and Logarithmic Functions. Hyperbolic and Inverse Hyperbolic functions.	5	3	2
Application of derivatives. Taylor and Maclaurin expansion, polynomial, and series. Extrema of a function. Asymptote lines. Curve Sketching.	10	6	4
Higher derivatives and Leibnitz rule. Indeterminate Forms and L'Hopital's Rule.	10	6	4
Definitions and properties of determinants and matrices, Algebra of Matrices. Inverse Matrix.	5	3	5
Reduced matrix. Rank of a Matrix. Solution of linear systems using inverse Matrix, and Cramer's Rule	10	6	4
Gauss - Jordan Method. Homogeneous and non-homogeneous systems. Square and rectangular systems	5	3	5
Solution of linear algebraic systems by Iterative Methods. Jacobi method, Seidel Method.	5	3	2
Eigenvalues and Eigenvectors of a matrix.	10	6	4

Teaching And Learning Methodologies :

Interactive Lecturing

Discussion

Problem Solving

Course Assessment :

Methods of assessment	Relative weight %	Week No	Assess What
Assignments	10.00		
Final exam	40.00		
First Exam	20.00		
Performance	10.00		

Second Exam

20.00

Course Notes :

Handouts on the Moodle

Recommended books :

ÅEarl W. Swokowski, "Calculus with Analytic Geometry, Prindle, Weber & Schmidt.

Å Peter V. O'Neil, "Advanced Engineering Mathematics".

Å Larson, R, Edwards, B & Falvo, D 2004, Elementary linear algebra, 5th edn, Houghton Muffling, Boston, Massachusetts.

Periodicals :

www.sosmath.com, www.math.hmc.edu,
www.tutorial.math.lamar.edu,
www.web.mit.edu

Web Sites :

www.sosmath.com, www.math.hmc.edu,
www.tutorial.math.lamar.edu,
www.web.mit.edu