

## 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
Lecturer	Hany Abd El Ghaffar Abd El Aty El Deeb	
Lecturer	Soliman Abdulkarim Alkhatib	7
Assistant Lecturer	Doaa Nabil Sayed Mohamed Elsayed Khodair	10
Assistant Lecturer	Basma Magdy Ahmed Mohamed	12
Assistant Lecturer	TAREK ALI ABDALLAH TEAMA	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 :

#### 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 Maclaurin 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.

**c. Professional and Practical Skills: :**

1 -	Perform curve sketching to represent different engineering systems.
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**d. General and Transferable Skills: :**

1 -	Communicate effectively
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**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Concept of a function, limits, properties, Continuity, and Differentiation.	5	1	1
Rules of Differentiation. Chain rule, Implicit Differentiation. Differentiation of parametric functions.	5	1	1
Transcendental functions and differentiation. Trigonometric and Inverse Trigonometric Functions. Exponential and Logarithmic Functions. Hyperbolic and Inverse Hyperbolic functions	5	1	1
Application of derivatives. Taylor and Maclaurin expansion, polynomial, and series. Extrema of a function. Asymptote lines. Curve Sketching.	10	2	2
Higher derivatives and Leibnitz rule. Indeterminate Forms and L'Hopital's Rule	10	2	2
Definitions and properties of determinants and matrices, Algebra of Matrices. Inverse Matrix.	5	1	1

**Course Topic And Contents :**

Topic	No. of hours	Lecture	Tutorial / Practical
Reduced matrix. Rank of a Matrix. Solution of linear systems using inverse Matrix, and Cramer's Rule	10	2	1
Gauss - Jordan Method. Homogeneous and non-homogeneous systems. Square and rectangular systems	5	1	1
Solution of linear algebraic systems by Iterative Methods. Jacobi method, Seidel Method	5	1	1
Solution of linear algebraic systems by Iterative Methods. Jacobi method,	5	1	1
Eigenvalues and Eigenvectors of a matrix.	5	1	1
Eigenvalues and Eigenvectors of a matrix.	5	1	1

**Teaching And Learning Methodologies :**

Interactive Lecturing  
Discussion  
Problem-based Learning

**Course Assessment :**

Methods of assessment	Relative weight %	Week No	Assess What
Final Exam	40.00		
Mid- Exam 1I	25.00		
Mid- Exam I	25.00		
Performance	10.00		

**Course Notes :**

**Recommended books :**

**Periodicals :**

**Web Sites :**