COURSE STRUCTURE

Course Code	UMA1001A			
Course Category	Basic Sciences			
Course Title	Linear Algebra and Differential Calculus			
Teaching Scheme and Credits	L	T	Laboratory	Credits
Weekly load hrs.	03 hours	1 hour	--	2+1+0=3

Pre-requisites: HSC (Mathematics)

Course Objectives:

1) To learn Basic Concepts of Mathematics useful for Engineering.
2) To apply mathematical tools in various engineering problems.

Course Outcomes:
After completion of this course students will be able to

1) apply the knowledge of Matrices for solving system of Linear equations ,compute Eigen values and Eigen vectors and applications in computational geometry.
2) evaluate n^{th} order derivatives, Taylor's and Maclaurin's series expansion of a function useful in analysis of engineering problems.
3) deal with derivatives of functions of several variables that are essential in various branches of engineering.
4) Examine maxima / minima of real variable functions, error estimation and approximation. Apply concept of Jacobian to find functional dependence.

Course Contents:
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Theory of Matrices   (10 Hrs.)

Rank of a matrix, System of Linear Equations, Linear dependence and Independence, Linear and Orthogonal Transformations, Orthogonal matrix, Matrix Eigen value problems, Caley-Hamilton Theorem, Applications of Matrices; scaling, stretching, reflections, rotation, translation in XY-plane, rotation about coordinate axes in three dimensional space.

Differential Calculus   (05 Hrs.)

n^{th} derivative of standard functions, Leibnitz's Theorem and problems, Taylor's and Maclaurin's series expansion of a function.

Partial Differentiation   (08 Hrs.)
Introduction to functions of several variable, Partial derivatives, Euler's Theorem for Homogeneous functions, Partial derivatives of Composite and Implicit functions, Total derivative.

Application of Partial Differentiation   (07 Hrs.)

Errors and approximations, Maxima and Minima of a function of two independent variables, Lagrange's method of undetermined multipliers, Jacobians and Functional Dependence.

Tutorial Exercises:

1. Rank of a matrix, System of Linear Equations.

2. Linear dependence and Independence of vectors, Orthogonal matrix

3. Eigen values &Eigen Vectors, Applications of matrices.

4. n^{th}derivative of functions.
5. Leibnitz's Theorem.
6. Taylor's series and Maclaurin's series.
7. Partial Differentiation and related problems
8. Euler's Theorem and its deductions.
9. Partial derivatives of Composite function and Implicit functions,
10. Total derivative, Errors and Approximations.
11. Maxima and Minima of a function of two variable, Lagrange's method of undetermined multiplier.
12. Jacobians and Functional Dependence

Three tutorials will be conducted using Mathematical Software.

Learning Resources:

Reference Books

1. Kreyszig Erwin, "Advanced Engineering Mathematics", 10th edition, Wiley Eastern Limited2015.

2. Greenberg Michael D., "Advanced Engineering Mathematics", 2^{nd}edition, Pearson 2009.

3. Grewal B.S. "Higher Engineering Mathematics", 44th edition, Khanna Publishers 2017.

4. David F. Rogers, J. Alan Adams,"Mathematical Elements For Computer Graphics" McGraw-Hill 1976.

Supplementary Reading:

Weber H.J. and Arfken G.B. "Mathematical Methods For Physicists" , 6th edition, Academic Press 2011.

Web Resources:

http://nptel.ac.in/courses/111105035/6

https://www.khanacademy.org/math/precalculus/x9e81a4f98389efdf:matrices/x9e81a4f98389efdf:matrices-as-transformations/v/matrix-transformation-triangle

MOOCs (Coursera)
https://www.edx.org/course/calculus-1c-coordinate-systems-infinite-mitx-18-01-3x-0

https://nptel.ac.in/courses/122/104/122104017/

Pedagogy:

1. Team teaching
2. Group activity
3. Audio- video techniques
4. Tutorials and class tests

Assessment Scheme:

Class Continuous Assessment (CCA): 100 marks

short term Question answers Tests	Tutorial	Mid Term Test	Group Activity	Case study	MCQ	Oral	Attendance	Total
20 Marks	50 Marks	15 Marks	15 Marks	Nil	Nil	Nil	Nil	100 Marks

Laboratory Continuous Assessment (LCA): **NA**

Regularity and punctuality	Understanding of objective	Understanding of procedure	Experimental skills	Ethics

Term End Examination : 50 marks

Module No.	Contents	Workload in Hrs		
		Theory	*Tutorial*	*Assess*
1	Theory of Matrices	10	3	--
2	Differential Calculus	5	3	--
3	Partial Differentiation	8	3	--
4	Applications of Partial Differentiation	7	3	---

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