	ITER, SIKSHA 'O' ANUSANDHAN (**DEEMED TO BE UNIVERSITY**)	**LESSON PLAN**	
Programme	**B. Tech**	Academic Year	**2023-2024**
Department	**CS/CSIT/EE/ECE**	Semester	**4th**
Credit	**4**	Grading Pattern	**6**
Subject Code	**MTH 3003**		
Subject Name	**APPLIED LINEAR ALGEBRA**		
Weekly Course Format	**4L**		
Instructor	**Prof. Anita Panda**		

Textbook(s):

(1) **LINEAR ALGEBRA AND ITS APPLICATION** by **Gilbert Strang** (4th edition)

Course Outcomes	After the end of this course, the students will be able to	
	CO1	Apply Gauss elimination principle to solve system of linear equations and elementary matrices to get LU and LDU factorization of a matrix.
	CO2	Explain vector space, subspace, null space and column space, linear independence.
	CO3	Explain basis and dimension of vector space and four fundamental subspaces, linear transformations and their applications.
	CO4	Explain orthogonality and its applications to find best fit solutions by least squares. Apply properties of determinants to solve the system of equations.
	CO5	Explain eigenvalues and eigenvectors and their application to solve system of differential equations and apply it to complex matrices, diagonalization of matrix and similarity transformations.
	CO6	Explain Singular Value Decomposition, pseudo-inverse, condition number, norm of a matrix.

Lectures	Lessons/Topics to be covered	Book reference (Sections)	Mapping with COs	Home Work/ Assignments/ Quizzes
1	Introduction to the Course and syllabus	1.1	All COs	
2	The Geometry of Linear Equations	1.2 (Page 3-5)	CO1	
3	The Geometry of Linear Equations	1.2 (Page 5-11)	CO1	
4	Gaussian Elimination	1.3 (Page 11-15)	CO1	
5	Gaussian Elimination	1.3 (Page 15-19)	CO1	
6	Matrix Notation and Matrix Multiplication	1.4 (Page 19-32)	CO1	
7	Triangular Factors and Row Exchanges	1.5 (Page 32-37)	CO1	
8	Triangular Factors and Row Exchanges	1.5 (Page 37-45)	CO2	
9	Inverses and Transposes	1.6 (Page 45-49)	CO2	
10	Inverses and Transposes	1.6 (Page 49-58)	CO2	Assignment 1
11	Vector Spaces and Subspaces	2.1 (Page 69-71)	CO2	Quiz 1
12	Vector Spaces and Subspaces	2.1 (Page 71-77)	CO2	
13	Solving $Ax = 0$ and $Ax = b$	2.2 (Page 77-79)	CO2	
14	Solving $Ax = 0$ and $Ax = b$	2.2 (Page 80-83)	CO2	
15	Solving $Ax = 0$ and $Ax = b$	2.2 (Page 83-91)	CO3	
16	Linear Independence	2.3 (Page 92-95)	CO3	
17	Basis, and Dimension	2.3 (Page 95-96)	CO3	
18	Basis, and Dimension	2.3 (Page 96-98)	CO3	
19	The Four Fundamental Subspaces	2.4 (Page 102-107)	CO3	
20	The Four Fundamental Subspaces	2.4 (Page 107-114)	CO3	Assignment 2
21	Orthogonal Vectors and Subspaces	3.1 (Page 141-152)	CO4	Quiz 2
22	Cosines and Projections onto Lines	3.2 (Page 152-154)	CO4	
23	Cosines and Projections onto Lines	3.2 (Page 154-160)	CO4	
24	Projections and Least Squares	3.3 (Page 160-165)	CO4	
25	Projections and Least Squares	3.3 (Page 165-174)	CO4	
26	Properties and Formulas of the Determinant	4.2 (Page 203-210)	CO4	
27	Applications of the Determinant	4.4 (Page 220-225)	CO4	
28	Applications of the Determinant	4.4 (Page 226-228)	CO4	
29	Eigenvalues and Eigenvectors (Basics)	5.1 (Page 235-236)	CO4	
30	Eigenvalues and Eigenvectors (Properties)	5.1 (Page 238-240)	CO5	Assignment 3

Lectures	Lessons/Topics to be covered	Book reference (Sections)	Mapping with COs	Home Work/ Assignments/ Quizzes
31	Eigenvalues and Eigenvectors (System of Differential Eqns.)	5.1 (Page 233-237)	CO5	Quiz 3
32	Eigenvalues and Eigenvectors	5.1 (Page 240-242)	CO5	
33	Eigenvalues and Eigenvectors	5.1 (Page 243-244)	CO5	
34	Diagonalization of a Matrix	5.2 (Page 245-248)	CO5	
35	Diagonalization of a Matrix	5.2 (Page 248-250)	CO5	
36	Application of Diagonalization of a Matrix	5.2 (Page 250-254)	CO5	
37	Complex Matrices (Definition, Basics)	5.5 (Page 280-282)	CO5	
38	Complex Matrices (Length, inner product)	5.5 (Page 282-283)	CO5	
39	Complex Matrices (Different types of complex matrices)	5.5 (Page 283-286)	CO6	
40	Complex Matrices (Theorems and properties of special matrices)	5.5 (Page 286-288)	CO6	Assignment 4
41	Complex Matrices (Problem Solving)	5.5 (Page 288-292)	CO6	Quiz 4
42	Tests for Positive Definiteness	6.2 (Page 318-322)	CO6	
43	Tests for Positive Definiteness	6.2 (Page 322-329)	CO6	
44	Singular Value Decomposition	6.3 (Page 331-332)	CO6	
45	Singular Value Decomposition (Applications)	6.3 (Page 332-336)	CO6	
46	Singular Value Decomposition	6.3 (Page 337-338)	CO6	
47	Matrix Norm and Condition Number	7.2 (Page 352-259)	CO6	
48	Iterative Methods for $Ax = b$	7.4 (Page 367-375)	CO6	