



(Established under Karnataka Act No. 16 of 2013)

100 Feet Ring Road

BSK III Stage

Bengaluru – 560085

Department of Science and Humanities

Course Title: Linear Algebra

Course Code: UE21MA241B

Contact hours: 75

LPTSC : (4-0-0-4-4)

Lesson Plan

Class No.	Chapter Title / Reference	Portions to be Covered	Percentage of Syllabus Covered	Percentage of Syllabus Covered (Cumulative)
1	Unit 1: Matrices and Gaussian Elimination T1:pg :3-9, Pg: 11-15, Pg:21-22, pg: 32-39, pg :45-47, pg: 49-51	Introduction to Linear Algebra	20	20
2-3		The Geometry of Linear Equations – Row and Column Pictures		
4		Singular cases in two and three dimensions		
5-7		Gaussian Elimination, The breakdown of elimination		
8		Elimination Matrices		
9-10		Triangular Factors (LU and Cholesky method) and Row Exchanges		
11		Inverse by Gauss -Jordan Method, Transposes		
12		Applications		
13		Matlab Class Number 1 – Introduction		
14		Classwork/Assignment		
15		ISA1		
16-17	Unit 2: Vector Spaces T1: pg 69-71, pg 78-81, pg 92-98, pg 102-105, R2: 7.6 R1:Pg 178-179	Vector Spaces and Subspaces (Definition only), Column Space and Null Space, Examples	20	40
18-19		Echelon Form, Row Reduced Form, Pivot Variables , Free variables		
20		Sum of subspaces, Direct sums		
21-23		Linear Independence, Basis and Dimensions		
24		The Four Fundamental Subspaces		
25		Uniqueness and Existence of Inverses Rank Nullity theorem		
26		Applications		
27		Matlab Class Number 2 – Gaussian Elimination		
28		Matlab Class Number 3 -Inverse of a Matrix by Gauss Jordan Method		
29		Classwork/Assignment		
30		ISA2		

31,32	Unit 3: Orthogonality T1: pg 125-127, pg 127-129, pg 130-132, pg 141-148, pg 152-157, pg 160-167 R2: 11.1 to 11.4 R1: Pg 250-251	Linear Transformations , Examples, Transformations Represented by Matrices	20	60
33		Algebra of Linear Transformations, Invertible maps, Isomorphisms		
34,35		Rotations, Reflections and Projections		
36,37		Orthogonal Vectors and Subspaces, Orthogonal Bases		
38,39		Cosines and Projections onto Lines		
40		Projections and Least Squares		
41		Applications		
42		Classwork/Assignment		
43		Matlab Class Number 4 – LU Decomposition		
44		Matlab Class Number 5,6 - Span of Column Space of A, Four Fundamental Subspaces of A		
45		ISA3		
46-48	Unit 4: Orthogonalization , Eigen Values and Eigen Vectors T1: pg 174-178, pg 179-182, R3: pg 55-60, R1: pg 465-468 T1: pg 245-247, T1: pg 248-249, Pg 285 R1: Pg 452	Orthogonalization - Orthogonal Matrices, Properties, Rectangular Matrices with orthonormal columns	20	80
49-50		The Gram- Schmidt Orthogonalization, $A = QR$ Factorization		
51-53		Introduction to Eigen values and Eigenvectors, Properties of eigenvalues and Eigen vectors, Spectral theorem, Symmetric Matrices, Cayley-Hamilton theorem(Statement only)		
54,55		Diagonalization of a Matrix, Powers and Products of Matrices		
56		Applications		
57		Matlab Class Number 7 - Projections by Least Squares		
58		Matlab Class Number 8 - The Gram- Schmidt process.		
59		Classwork/Assignment		
60		ISA4 Matlab Class Number 9 - QR Factorization Matlab Class Number 10 - Eigen Values and Eigen Vectors		
61	Unit 5: Singular Value Decomposition R1: pg 471-472, 477 T1: pg 318-319 T1: pg 319-321 T1: pg 331-332 R1: pg 487-494 R1: pg 500-501 T1: Pg 335-336	Matlab Class Number 9 - QR Factorization	20	100
62		Matlab Class Number 10 - Eigen Values and Eigen Vectors		
63-65		Quadratic Forms, Definitions of positive definite, negative definite, positive semi-definite, negative semi-definite, Indefinite forms and Matrices		
66		Tests for Positive Definiteness		
67-68		Problems on Positive Definite Matrices and Least Squares, Problems on Semi-definite Matrices		
69-71		The Singular Value Decomposition of a Matrix, Examples		
72		Pseudoinverse		
73		Applications		
74		Matlab - In Semester Assessment		
75		ISA5		

Text Book:

T1: “Linear Algebra and its Applications”, Gilbert Strang, 4th Edition, Thomson Brooks/ Cole, Second Indian Reprint 2007..

Reference Books:

R1: Linear Algebra and its Applications, David .C lay, Publication by Pearson, 5th Edition, 2015.

R2: Linear Algebra, Schaum’s outlines, Seymour Lipschutz and Marc Lipson, 4th Edition, McGraw-Hill publications, 2009.

R3: Higher Engineering Mathematics, B S Grewal, 44th Edition, Khanna Publishers,2020.

R4: Practical Linear Algebra, Gerald Farin and Dianne Hansford, 3rd Edition, CRC Press, Taylor & Francis Group, 2013.

MATLAB:

1. Introduction and Gaussian Elimination.
2. Inverse of a Matrix by the Gauss- Jordan Method
3. The LU Decomposition
4. The Span of Column Space of a Matrix
5. The Four Fundamental Subspaces
6. The Gram-Schmidt Orthogonalization.
7. QR factorization
8. Projections by Least Squares
9. Eigen values and Eigen Vectors of a Matrix.

Reference Books:

1: Getting started with MATLAB, Rudra Pratap, Oxford University Press, 7th Edition, 2016.

2: MATLAB for Engineers, Holly Moore, Pearson Publications, New Jersey, 5th Edition, 2018.

