Guidelines
B.Sc. (H) Computer Science DSC-03
(Mathematics for Computing)

S. No	Topic	Reference	
		Table of Content	**Book**
1	**Unit 1-** Introduction to Matrix Algebra: Echelon form of a Matrix, Rank of a Matrix, Determinant and Inverse of a matrix, Solution of Systemof Homogeneous & Non-HomogeneousEquations: Gauss elimination and Gauss Jordan Method.	Ch-7: excluding Cramer's rule and section 7.9	[1]
2	**Unit 2 -** Vector Space, Sub- spaces, Linear Combinations, Linear Span, Linear Independence/ Dependence, Basis & Dimension, Linear transformation on finite dimensional vector spaces, Inner Product Space, Schwarz Inequality, Orthonormal Basis, Gram-Schmidt Orthogonalization Process, Convex Sets	Ch-4: 4.1, 4.2, 4.3, 4.5 ,4.6 Ch-6: 6.1, 6.2, 6.4, 6.7 - upto Theorem 17 Ch-8: 8.3 upto Theorem 7	[2]
3	**Unit 3 -** EigenValue and EigenVector: Characteristic Polynomial, Cayley Hamilton Theorem (Only in numericals), Eigen Value And eigen vector of a matrix, eigenspaces, Diagonalization	Ch-5: 5.1 - 5.3	[2]
	Positive Definite Matrices, Applications to Markov Matrices	Ch-7: 7.2 page 407-408 Ch-4: 4.9	[2]
4	**Unit 4 -** Vector Calculus: Vector Algebra, Laws of Vector Algebra, Dot Product, Cross Product, Vector and Scalar Fields, Ordinary Derivative of Vectors, Space Curves, Partial Derivatives, Del Operator, Gradient of a Scalar Field, Directional Derivative, Gradient of Matrices, Divergence of a Vector Field, Laplacian Operator, Curlof a Vector Field.	Ch-9: 9.1 - 9.4, 9.7 - 9.9	[1]

Note: Proofs of theorems to be skipped. Applications/problems pertaining to the theorems must be discussed in the class.

References:
1. Kreyszig Erwin, "Advanced Engineering Mathematics", 10th Edition, Wiley, 2015.
2. David C. Lay, Steven R. Lay and Judi J. McDonald, "Linear Algebra and its applications", 5th edition, Pearson.

Additional References:
1. Strang Gilbert, "Introduction to Linear Algebra", 5th Edition, Wellesley-Cambridge Press, 2021.
2. Stephen Andrilli and David Hecker, "Elementary Linear Algebra", Fourth Edition, Academic Press, 2010, ISBN: 978-0-12-374751-8
* Deisenroth, Marc Peter, Faisal A. Aldo and Ong Chengsoonm "Mathematics for Machine Learning, 1st Edition, Cambridge University Press, 2020

List of Practicals:

1. Find cofactors, determinant, adjoint and inverse of a matrix.

2. Convert the matrix into echelon form and find its rank.

3. Solve a system of equations using Gauss elimination method.

4. Solve a system of equations using the Gauss Jordan method.

5. Verify the linear dependence of vectors. Generate a linear combination of given vectors of Rn/ matrices of the same size.

6. Check the diagonalizable property of matrices and find the corresponding eigenvalue and verify the Cayley-Hamilton theorem.

7. Compute Gradient of a scalar field, Divergence and Curl of a vector field.