Guidelines

B.Sc. (H) Computer Science Semester I

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	
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.
3. Jain R. K., Iyengar S.R. K. Advanced Engineering Mathematics, 5th Edition, Narosa, 2016.
4. Deisenroth, Marc Peter, Faisal A. Aldo and Ong Chengsoonm "Mathematics for Machine Learning, 1st Edition, Cambridge University Press, 2020.
5. Lipschutz Seymour and Lipson Marc. Schaum's Outline of Linear Algebra, 6th Edition, McGraw Hill, 2017.

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 R^n/ 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.