Department of Mathematical and Computational Sciences
National Institute of Technology Karnataka, Surathkal
Course Plan and Evaluation Plan

Course Code	: MA204
Course Title	: Linear Algebra and Matrices
L-T-P	: 3-0-0 (Credits 03)
Course Instructor	:Dr. P. Sam Johnson https://sam.nitk.ac.in/
Course Webpage	: https://sam.nitk.ac.in/MA204.html
Teaching Department	: Mathematical and Computational Sciences (MACS)
Course coverage	: 40 Hours (Lecture Schedule)

Contents

- **Linear Equations:** Systems of linear equations, elementary matrices, row reduction and echelon forms, matrix multiplication, Gaussian elimination, LU factorization, transposes, finding inverses by elementary row operations.
- **Vector spaces:** Definition, examples, subspaces, few elementary results with proof, linear dependence/independence of vectors, spanning set, basis, dimension, few results with proof.
- **Linear Transformations:** Definition, algebra of linear transformations, representation of transformations by matrices and vice-versa, null space, range space, few results on linear transfromations and rank-nullity theorem with proofs, finding matrix of a linear transformation with respect to given bases.
- **Orthogonality:** Inner product, length, orthogonal vectors, orthogonal basis, orthogonal subspaces, Cauchy Schwartz inequality, Gram-Schmidt process, QR decomposition, least-square problem.
- **Determinants:** Properties and formulas for the determinant, applications of determinant, Cramer's rule, finding the inverse of a partitioned matrix.
- **Eigenvalues and Eigenvectors:** The characteristic equation, finding eigenvalues and eigenvectors, properties of eigenvalues, diagonalization.
- **Symmetric Matrices and Quadratic Forms:** Diagonalization of symmetric matrices, quadratic forms, positive definiteness, singular value decomposition.

Reference Books :

1. **G. Strang, Linear Algebra and Its Applications, Thomson Asia, 2003.**
2. W. Cheney and D. Kincaid, Linear Algebra: Theory and Applications, Jones & Bartlett Student Edition, 2014.
3. S. Lang, Linear Algebra, 3rd Edition, Springer, 2004
4. S. Kumaresan, Linear Algebra: A Geometric Approach, PHI, 2008
5. G. Hadley, Linear Algebra, Narosa 2000.
6. K. Hoffman and R. Kunze, Linear Algebra, PHI, 2003

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