

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 Instructors : Dr. Chandhini G and 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 transformations 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**

Evaluation Plan :

Sl.No.	Exam	Weightage (%)	Date of exam	Tentative syllabus (Sections as per Reference [1])
1	Quiz-1	15	September 04, 2023 (Tentative)	1.1 to 1.7 ; 2.1 to 2.3
2	Midsem	20	As per Institute schedule	1.1 to 1.7 ; 2.1 to 2.6 ; 3.1 to 3.5
3	Quiz-2	15	November 13, 2023 (Tentative)	4.1 to 4.4 ; 5.1 to 5.6
4	Endsem	50	As per Institute schedule	Entire course content