

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

Course Code : MA222  
Course Title : Computational Linear Algebra  
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/MA222.html>  
Teaching Department : Mathematical and Computational Sciences (MACS)  
Course coverage : 40 Hours (Lecture Schedule)

**Contents**

- Matrix multiplication problems: Basic algorithms and notations, exploiting structure, block matrices and algorithms, vectorization and re-use issues.
- Matrix analysis: basic ideas from linear algebra, vector norms, matrix norms, finite precision matrix computations, orthogonality and SVD, projections and the CS decomposition, the sensitivity of square linear systems.
- General linear systems: Triangular systems, the LU factorization, roundoff analysis of Gaussian elimination, pivoting, improving and estimating accuracy.
- Special linear systems: The LU and QR factorizations, positive definite systems, banded systems, symmetric indefinite systems, block systems, vandermonde systems and the FFT, Toeplitz and related systems.

**Reference Books :**

1. **Gene H. Golub and Charles F. Van Loan, Matrix Computations, 3rd Edition, Hindustan book agency, 2007.**
2. A.R. Gourlay and G.A. Watson, Computational methods for matrix eigen problems, John Wiley & Sons, New York, 1973.
3. W.W. Hager, Applied numerical algebra, Prentice-Hall, Englewood Cliffs, N.J, 1988.
4. D.S. Watkins, Fundamentals of matrix computations, John Wiley and sons, N.Y, 1991.
5. C.F. Van Loan, Introduction to scientific computing: A Matrix vector approach using Matlab, Prentice-Hall, Upper Saddle River, N.J, 1997.

**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 1.4 ; 2.1 to 2.2
2	Midsem	20	As per Institute schedule	1.1 to 1.4 ; 2.1 to 2.7 ; 3.1 to 3.3
3	Quiz 2	15	November 13, 2023 (Tentative)	3.4 to 3.5 ; 4.1 to 4.2
4	Endsem	50	As per Institute schedule	Entire course content

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