MA11004 – Linear Algebra, Numerical and Complex Analysis

Teacher: M Rajesh Kannan

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Venue: MS Teams

Meeting Time: Wednesday 11-11.55; Thursday 12-12.55; Friday 8-8.55

Tutorials: Wednesday 3-3.55.

List of TAs:

Mainak Basunia	Sec 7 (1-23)	Sourav Hossain	Sec 8 (1-23)
Priyanka	Sec 7 (24-46)	Md. Abhu Raiham	Sec 8 (24-46)
Rony Mitra	Sec 7 (47-69)	Anushree Belel	Sec 8 (47-69)
Subhadip Pramanik	Sec 7 (70-91)	Nibedita Ghosh	Sec 8 (70-91)

Syllabus

Linear Algebra: Vector spaces over arbitrary field, subspaces, linear combination, spanning set, linear dependence and independence of vectors, basis and dimension of vector spaces. Rank of a matrix and, solution of system of equations using rank concept, Gauss elimination method to solve system of linear equations. Linear transformation, rank-nullity theorem, matrix representation of a linear transformation, Inner product, Norms of vectors, orthogonal vectors, Cauchy Schwarz Inequality (statement only), Eigenvalues and Eigenvectors of matrices and their properties (Hermitian, Skew-Hermitian, Unitary matrices), diagonalization, Cayley-Hamilton Theorem (statement only).

Numerical Analysis: Iterative method for solution of system of linear equations Jacobi and Gauss Seidel method. Solution for transcendental equations: Bisection, Fixed point iteration, Newton-Raphson methods, Regula falsi methods. Finite differences, Interpolation, error in interpolation polynomial Newton's forward and backward interpolation formula, Lagrange's interpolation formula, Trapezoidal and Simpson's ⅓ rules for numerical integration.

Complex Analysis: Limit, continuity, differentiability and analyticity of functions, Cauchy-Riemann equations, line integrals in complex plane, Cauchy's integral formula, derivatives of analytic functions, Cauchy's integral theorem, Taylor's series, Laurent series, zeros and singularities, residue theorem, evaluation of real integrals.

Text book

- Advanced Engineering Mathematics - Erwin Kreyszig.

Reference books

1. Linear Algebra and its applications – Gilbert Stang.
2. Introduction to Applied Linear Algebra – Vectors, Matrices, and Least Squares - Stephen Boyd and Lieven Vandenberghe (Available here for free: https://web.stanford.edu/~boyd/vmls/vmls.pdf)
3. Numerical Analysis: Mathematics of Scientific Computing - David Kincaid, David Ronald Kincaid, Elliott Ward Cheney
4. Complex Variables and Applications - James Ward Brown and Ruel V. Churchill.