MA2003D MATHEMATICS
IV

Prerequisites: MA1001D Mathematics I, MA1002D Mathematics II

L	T	P	C
3	1	0	3

Total Hours: 39

Module 1: (9 hours)

Review of basic linear algebra topics, Direct sum of vector spaces, Rank-nullity theorem and its proof, Matrix representation of linear transformation, change of basis, Invariant subspaces, Polynomials applied to operators, Upper triangular representation for complex operators, Diagonalisation, Invariant subspaces on real vector spaces.

Module 2: (11 hours)

Inner product spaces, Orthogonal basis, Orthogonal projection, Best approximation, Linear functional, Adjoint of a linear transformation, Self-adjoint and normal operators, Spectral theorem for normal operators on complex inner product spaces, Spectral theorem for self adjoint operators, Normal operators on real inner product spaces, Positive operators, Isometries.

Module 3: (9 hours)

Complex functions, Derivative, Analytic function, Cauchy-Riemann equations, Laplace's equation. Geometry of analytic functions: Conformal mapping, Linear fractional Transformations, Schwarz - Christoffel transformation, Transformation by other functions.

Module 4: (10 hours)

Line integral in the Complex plane, Cauchy's Integral Theorem, Cauchy's Integral formula, Derivatives of analytic functions. Power series, Functions given by power series, Taylor series and Maclaurin series. Laurent's series, Singularities and Zeros, Residue integration method, Evaluation of real integrals.

References:

1. S. Axler, *Linear algebra done right*, 2/e, Springer, 2015.
2. S. Lipschutz and M. Lipson, *Schaum's outline of linear algebra*, 6/e, McGraw-Hill, 2017.
3. E. Kreyszig, H. Kreyszig, and E. J. Norminton, *Advanced engineering mathematics: international student version*, 10/e, New Delhi: Wiley, 2015.
4. C. R. Wylie and L. C. Barrett, *Advanced engineering mathematics*, 6/e, McGraw-Hill, 1995.