

GRADUATE SCHOOL – MATHEMATICAL PHYSICS – I

1. THEORY OF COMPLEX VARIABLES

Laurent series, zeros of analytic functions, isolated singularities, removable singularities, poles, essential singularities, Picard's theorem, non-isolated essential singularities, residues, calculating residues, Cauchy's residue theorem, real trigonometric integrals, improper integrals, the Cauchy principal value, Jordan's lemma.

2. POWER SERIES SOLUTIONS AND SPECIAL FUNCTIONS

Second Order Linear Equations. Ordinary Points, Regular Singular Points
Gauss's Hypergeometric Equation

3. FOURIER SERIES AND ORTHOGONAL FUNCTIONS

The Fourier Coefficients, the Problem of Convergence, Even and Odd Functions. Cosine and Sine Series, Extension to Arbitrary Intervals Orthogonal Functions

4. PDE AND BOUNDARY VALUE PROBLEMS AND GREEN'S Function

Eigenvalues, Eigenfunctions, the Wave Equation, The Heat Equation, The Dirichlet Problem for a Circle, Poisson's Integral, **separation of variables and other METHODS, Green's Functions and Sturm–Liouville Theory**

5. SOME SPECIAL FUNCTIONS OF MATHEMATICAL PHYSICS (Any two)

Legendre Polynomials Properties of Legendre Polynomials, Bessel Functions. The Gamma Function, Properties of Bessel functions, **Chebyshev Polynomial, Hypergeometric Function.**

6. VECTOR SPACE & LINEAR TRANSFORMATION

Vector spaces, linear independence and dependence of vectors, inner products, Linear transformations, Systems of linear equations-consistency and inconsistency, rank of a matrix, Eigen values and eigenvectors of a matrix, diagonalization of a matrix.

BOOKS

1. Churchill R.V., Brown J.W **Complex variables and applications (MGH)**
2. G. F. SIMMONS, **DIFFERENTIAL EQUATIONS (MGH)**
3. ARFKEN & WEBER, **MATHEMATICAL METHODS FOR PHYSICISTS (ACADEMIC PRESS)**
4. **Gilbert Strang: Linear Algebra and Its Applications -**