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 TREANSFORMATION
   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 -**