Bachelors with Mathematics as Major

8th Semester

MMT822J1: Mathematics/Applied Mathematics: COMPLEX ANALYSIS

Credits: 3 THEORY + 1 TUTORIAL **Theory: 45 Hours & Tutorial: 15 Hours**

Course Objective: To study the techniques of complex variables and functions together with their derivatives, contour integration, and transformations. To study complex power series, classification of singularities, calculus of residues and its applications in the evaluation of integrals, and other concepts and properties.

Course Outcomes: Identify curves and regions in the complex plane defined by simple expressions**.** To describe the basic properties of complex integration and the ability to compute such integrals.

Theory: 3 Credits

Unit I

Review of complex numbers, De-Movier's theorem and it's applications, functions of a complex variable, limit, continuity and differentiability of complex functions, analytic functions, CR equations, complex integration, Cauchy's theorem, Cauchy's integral formulae, Liouville's theorem, Fundamental theorem of algebra.

Unit II

Expansion of an analytic function in a power series, Taylor's and Laurant's theorems, classification of singularities, zeros of analytic functions, identity theorem, Maximum modulus theorem, argument principle, Rouche's theorem and its applications.

Unit III

Mobius transformations, their properties, fixed points and classification of Mobius transformations, cross ratio, inverse points, critical points. Mobius transformations carry circles to circles and inverse points to inverse points, Mobius transformation from a half plane to unit circle, circles to circles; infinite products, their convergence and absolute convergence.

Tutorial: 1 Credit

Unit IV

Expansion of $\sin n\theta$ and $\cos n\theta$ in terms of powers of $\sin\theta$ and $\cos\theta$, expansion of $\sin^n\theta$ and $\cos^n\theta$ in terms of multiples of θ, exponential, circular, hyperbolic, inverse hyperbolic and logarithmic functions of a complex variable and their properties, summation of trigonometric series: difference method and C+iS method.

Recommended Books:

1. L.V.Ahlfors, Complex Analysis, McGraw Hill, 2017.
2. S.Ponnasamy, Foundation of Complex Analysis, Narosa Publishers, 2011.
3. Schaum's outline Series, Complex Variables, 2nd Edition, McGraw Hill, 2009.
4. A. Aziz , N.A.Rather & B.A. Zargar, Complex Trigonometry, Kapoor & Sons, 2015.