COMPLEX ANALYSIS - I

Course No: **MM24203CR** Total Credits: **04**
Semester: **M.A/M.Sc 2nd Semester** Total Marks: **100**
Continuous Assessment: **Marks 20**, **Theory Marks: 80** Time Duration: **2½ Hrs Course**

Course objectives: To enable the students to understand the extensions of the real analysis problems to the complex domain in order to solve harder problems pertaining to the different disciplines.

Course Outcomes: Course outcomes for a Complex Analysis-I course typically focus on developing a deep understanding of complex numbers, analytic functions, and the theoretical foundations of complex analysis.

UNIT -I

Continuity and differentiability of complex functions, C-R equations and analytic functions, necessary and sufficient condition for a function to be analytic, complex integration, Cauchy Goursat theorem, Cauchy's integral formula, higher order derivatives, Morera's theorem, Cauchy's inequality**.**

UNIT -II

Liouville's Theorem and its generalization, fundamental theorem of algebra, Taylor's theorem, maximum modulus theorem, Schwarz lemma and its generalizations, zeros of an analytic function and their isolated character, identity theorem, argument principle , Rouche's theorem and its applications.

UNIT -III

Laurant's theorem, classification of singularities, removable singularity, Riemann's theorem, poles and behaviour of a function at a pole, essential singularity, Casorati-Weiersstras theorem on essential singularity, infinite products, convergence and divergence of infinite product, absolute convergence, necessary and sufficient conditions for convergence and absolute convergence.

UNIT -IV

Mobius transformations, their properties and classification, fixed points, cross ratio, inverse points and critical points, conformal mapping, linear transformations carry circles to circles and inverse points to inverse points, mappings of (i) upper half plane on to the unit disc, (ii) unit disc on to the unit disc, (iii) left half plane on to the unit disc and (iv) circle on to a circle. The transformation $w = z^2$ and $w = \frac{1}{2}\left(z + \frac{1}{z}\right)$.

Recommended Books:

1. L. Ahlfors, Complex Analysis, McGraw Hill (2000).
2. E. C.Titchmarsh, Theory of Functions, Oxford Univesity Press, 2nd Edition (1939).
3. J. B. Conway, Functions of a Complex Variable-1, Springer 2nd Edition 7th Printing (1995).
4. Richard Silverman, Complex Analysis, Dover Publications Inc. (1984).
5. H. A. Priestly, Introduction to complex Analysis, Pxford University Press (2008).
6. Z. Nehari, Conformal Mappings, Dover Publications Inc. (2003)