Course Type	Course Code	Name of Course	L	T	P	Credit
DE	**NMCD526**	Complex Analysis	3	0	0	3

Course Objective

- The objective of this course is to introduce the fundamental ideas of the functions of complex variables and developing a clear understanding of the fundamental concepts of Complex Analysis such as analytic functions, complex integrals and a range of skills which will allow students to work effectively with the concepts.

Learning Outcomes

After completing this course, students should demonstrate competency in the following skills:

- Becoming familiar with the concepts Complex numbers and their properties and operations with Complex number.
- Evaluating limits and checking the continuity of complex function.
- Checking differentiability and Analyticity of functions.
- Evaluate Complex integrals and applying Cauchy integral.

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1	Limits and continuity, differentiability of complex functions, Analytic functions, analytic branches of inverse of functions, branches of logarithm, Cauchy-Riemann equations, and harmonic conjugates.	8	To introduce fundamental results concerning limits, continuity and careful treatment of analytic functions of complex variable.
2	Complex integration, Cauchy's theorem, integral formula, Morera's Theorem, Liouville's theorem, Cauchy's inequality.	8	To study the technical machinery that is required to introduce the complex line integral, also called the contour integral.
3	Series of complex functions, Taylor series, Laurent series.	8	To study the power series expansions for analytic functions.
4	Zeros of an analytic function, Singularities and their classification, residue at a singularity, residue at infinity and residue theorem, contour integrals.	9	To discuss the zeros of analytic functions using Taylor's series expansion tool. Further, classification of isolated singularities in a simple way using Laurent's series has been emphasized. Later the method of residue calculus for evaluating certain types of definite and improper integrals has been studied.
5	Bilinear transformation: Bilinear transformation, conformal mapping, elementary properties of the mapping of exponential, sine and cosine functions, fundamental theorem of algebra, Identity Theorem Rouche's Theorem.	9	To study bilinear transformation, its various types and properties. Also, how the number of zeros of analytic functions remains constant under small perturbations have been studied.
Total		**42**	

Text Books:

1. R.V Churchill & J.W. Brown: Complex Variables and Applications, Mc-Graw Hill, 1990.
2. Alan Jaffery, Complex Analysis and Applications, Chapman and Hall/CRC, 2005

Reference Books:

1. J. H. Mathews and R. W. Howell, Complex Analysis for Mathematics and Engineering, Narosa, 1998
2. E. Kreyszig, Advanced Engineering Mathematics, 10th Ed., John Willey & Sons, 2010.