SEMESTER – VI
MJC-10: Complex Analysis

Course Outcomes

After the completion of the course, the student will be able to:

CO1: Understand the significance of differentiability of complex functions leading to the understanding of Cauchy-Riemann equations.

CO2: Evaluate the contour integrals and understand the role of Cauchy-Goursat theorem and the Cauchy integral formula.

CO3: Expand some simple functions as their Taylor and Laurent series, get familiar with the linear transformation and Mobius transformation.

MJC-10: Complex Analysis (4 credits) Full Marks-100		
Unit	**Topics to be covered**	**No. of Lectures**
1	Introduction to complex number and its geometrical interpretation, algebra of complex numbers, functions of complex variables, limit of a complex function, continuity and uniform continuity, differentiability, Analytic and regular functions, Cauchy-Riemann equation and it's applications.	08
2	Exponential function, logarithmic function, Branches and derivatives of logarithms, trigonometric and hyperbolic functions, derivatives of functions, Definite integrals of functions, Contours, Contour integrals with examples, Upper bounds for moduli of contour integrals.	08
3	Complex integration, Cauchy's theorem, Cauchy's Goursat theorem, primitives, Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Morera's theorem, Poisson's integral formula for a circle, Cauchy's inequality, Liouville's Theorem and Fundamental theorem of Algebra.	08
4	Convergence of sequences and series, Taylor series with examples; Laurent series and its examples, Absolute and uniform convergence of power series, Uniqueness of series representations of power series.	08
5	Linear Transformation, Jacobian of a transformation, Elementary transformations: translation, rotation, magnification, inversion, Mobius transformation (bilinear transformation), Cross ratio, preservation of cross ratio under bilinear transformation, fixed point of a bilinear transformation.	08
	TOTAL	40

Book References:

1. Brown, James Ward, & Churchill, R. V. (2014). Complex Variables and Applications (9th ed.). McGraw-Hill Education. New York.
2. S. Ponnusamy, (2011) Foundation of complex Analysis, Alpha Science International Ltd. UK.
3. Bak, Joseph & Newman, Donald J. (2010). Complex analysis (3rd ed.). Undergraduate Texts in Mathematics, Springer. New York.
4. Zills, Dennis G., & Shanahan, Patrick D. (2003). A First Course in Complex Analysis with Applications. Jones & Bartlett Publishers, Inc.
5. Mathews, John H., & Howell, Rusell W. (2012). Complex Analysis for Mathematics and Engineering (6th ed.). Jones & Bartlett Learning. Narosa, Delhi. Indian Edition.