



**SARDAR PATEL UNIVERSITY**  
Vallabh Vidyanagar, Gujarat  
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25)  
Syllabus with effect from the Academic Year 2021-2022

(Master of Science) (Mathematics)  
(M.Sc.) (Mathematics) Semester (I)

Course Code	PS01CMTH51	Title of the Course	Complex Analysis I
Total Credits of the Course	04	Hours per Week	04
Course Objectives:	This paper leads the students familiar with the functions of complex variables, their properties.		

Course Content		
Unit	Description	Weightage* (%)
1.	Argument of complex number, limit and continuity of a complex function, derivative of a complex function, Cauchy-Riemann equations, Sufficient conditions for differentiability, Polar coordinates.	25
2.	Analytic functions, harmonic functions, exponential functions, logarithm function, Branches and derivative of logarithms, Derivative of function $w(t)$ , Definite integrals of function $w(t)$ , Contours, contour integrals and examples, upper bounds for moduli of contour integrals.	25
3.	Anti-derivative, Cauchy's theorem, Cauchy's Integral Formula, its extension, and consequences, Cauchy inequality, Liouville's theorem, Fundamental Theorem of Algebra, Morera's theorem, Cauchy-Goursat's theorem. Gauss mean value theorem, Principle of deformation of paths, maximum modulus principle.	25
4.	Taylor's theorem and its examples, Laurent series and its examples, absolute and uniform convergence of power series, continuity of sums of power series, integration and differentiation of a power series, Classification of singularities, residues, residue theorem, residues at poles, evaluation of improper real integrals, Jordan's lemma (without proof), definite integrals with sine and cosine function, Mobius transformation and an implicit form.	25

Teaching-Learning Methodology	Classroom teaching and learning.
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Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course, the learner will be able to	
1.	clear concept of function of complex variables, its basic properties viz. limits, continuity, differentiability and analyticity.
2.	gain the knowledge of elementary functions and harmonic functions, power series of Harmonic functions
3.	clear concept of contour integrals, various results of Contour Integral, Cauchy-Goursat's theorem and applications, idea of series expansions at the singular points by Laurents series and its application in complex integrations.
4.	classify singularities of complex functions, residue theorem and its applications to solve improper real integral.

Suggested References:	
Sr. No.	References
1.	Churchil, R.V., Brown, J. and Verle, R., Complex Variables and Applications, McGraw-Hill Publ. Co., Eighth edition, 2009.
2.	Conway J.B., Functions of One Complex Variable, (Second Edition), Narosa Publ. House, New Delhi, 1994.
3.	Ponnusamy S., Foundations of Complex Analysis, Narosa Publ. House, New Delhi, 1995.
4.	Choudhary B., The Elements of Complex Analysis, (Second Edition), Wiley Eastern Ltd., New Delhi, 1992.

On-line resources to be used if available as reference material
On-line Resources

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