

B.Sc. DEGREE PROGRAMME
MATHEMATICS (CORE COURSE)
SIXTH SEMESTER
MM6B010 : COMPLEX ANALYSIS

5 hours/week

4 credits

30 weightage

Text : James Ward Brown and Ruel V. Churchill : Complex Variables and Applications (8th Edn.), McGraw Hill.

Module I : Analytic Functions (24 hrs)

Functions of complex variable, Limits Theorems on limits, Limits involving the points at infinity, Continuity derivatives, Differentiation formula, Cauchy-Riemann Equations, Polar coordinates, Analytic functions, Harmonic functions

(Sec: 12, 15 to 26 of Chapter 2)

Elementary functions

The exponential function, Logarithmic function, Complex exponents, Trigonometric functions, Hyperbolic functions, Inverse Trigonometric and Hyperbolic functions.

(Sec. 29 to 36 of Chapter 3)

Module II : Integrals (22 hrs)

Derivatives of functions $\omega(t)$; Indefinite integral of $\omega(t)$; Contours, Contour integrals, Antiderivatives, Cauchy-Goursat theorem (without proof), Simply and multiply connected domains, Cauchy's integral formula and its extension, Liouville's theorem and fundamental theorem of algebra, Maximum modulus principle.

(Sec: 37 to 54 excluding 42, 47 of Chapter 4)

Module III : Series (22 hrs)

A quick review of convergence of sequence and series of complex numbers.

Taylor series, Laurents series (without proof), Applications.

Power series: Absolute and uniform convergence. Continuity of sum of power series, Differentiation and integration of power series, Multiplication and division of power series.

(Sec: 55 to 60 & 62 to 67 of Chapter 5).

Module IV : Residues (22 hrs)

Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Three types of isolated singular points, Residues at poles, Zeroes of analytic functions, Zeroes and poles.

(Sec: 68 to 76 of Chapter 6).

Applications of residues

Evaluation of improper integrals, Jordan's Lemma (statement only), Definite integrals involving sines and cosines.

(Sec: 78, 79, 80 and 85 of Chapter 7).

References

1. Mark J. Ablowitz and Athanassios S. Fokas: Complex Variables, Cambridge Text, 2nd Edn.
2. S. Ponnusamy : Foundation of Complex Analysis : Narosa.
3. Murray R. Spiegel: Complex Variables, Schaum's Outline series.
4. J.M. Howie: Complex Analysis: Springer India Reprint.
5. Stewart & Tall: Complex Analysis, CUP.