

Course Name	Course Code	Semester	Credit
Complex Analysis	MT(N)-302	VI	4

COURSE NAME: COMPLEX ANALYSIS

COURSE CODE: MT(N)-302 CREDIT: 04

### **SYLLABUS**

#### **Complex Plane and functions**

Complex numbers and their representation, algebra of complex numbers; Complex plane, Open set, Domain and region in complex plane; Stereographic projection and Riemann sphere; Complex functions and their limits including limit at infinity; Continuity, Linear fractional transformations and their geometrical properties, Differentiability of a complex valued function.

#### **Analytic Functions and complex integration**

Cauchy–Riemann equations, Harmonic functions, necessary and sufficient conditions for differentiability, Analytic functions; Analyticity and zeros of exponential, trigonometric and logarithmic functions; branch point, Branch cut and branch of multi-valued functions, Line integral, Path independence, Complex integration, Green’s theorem, Anti-derivative theorem, Cauchy–Goursat theorem, Cauchy integral formula, Cauchy’s inequality, Derivative of analytic function, Liouville’s theorem, Fundamental theorem of algebra, Maximum modulus theorem and its consequences.

#### **Power Series**

Sequences, series and their convergence, Taylor series and Laurent series of analytic functions, Power series, Radius of convergence, Integration and differentiation of power series, Absolute and uniform convergence of power series.

#### **Singularities and analytic continuation**

Meromorphic functions, Zeros and poles of meromorphic functions, Nature of singularities, Picard’s theorem, Residues, Cauchy’s residue theorem, Argument principle, Rouché’s theorem, Jordan’s lemma, Evaluation of proper and improper integrals.

#### **REFERENCES**

- Ruel V.Churchill, (1960), Complex Variables and Applications, McGraw-Hill, New York.
- S. Ponnusamy, (2011), *Foundations of Complex Analysis* (2<sup>nd</sup> edition), Narosa Publishing House.
- Murray R. Spiegel, (2009), *Schaum's Outline of Complex Variables* (2<sup>nd</sup> edition).
- [https://archive.nptel.ac.in/content/syllabus\\_pdf/111106141.pdf](https://archive.nptel.ac.in/content/syllabus_pdf/111106141.pdf)

#### **SUGGESTED READINGS**

- L. V. Ahlfors, (1966), Complex Analysis, Second edition, McGraw-Hill, New York.
- J.B. Conway, (2000), Functions of One Complex Variable, Narosa Publishing House,
- E.T. Copson, (1970), Introduction to Theory of Functions of Complex Variable, Oxford University Press.
- Theodore W. Gamelin, (2001) Complex Analysis, Springer-Verlag, 2001.