

Course Name	: Real and Complex Analysis
Course Number	: MA-511
Credit	: 3-1-0-4
Prerequisites	: None
Students intended for	: M.Sc. /M.S./Ph.D. /B.Tech 3 rd and 4 th year
Elective or core	: Core for M.Sc. in applied Mathematics and Elective for other discipline.
Semester	: Odd/Even

Preamble: The objective of this course is to introduce real and complex analysis. The contents are designed in such a way that it will give foundation of mathematics at a level and depth appropriate for someone aspiring to study higher level mathematics.

1. Introduction to real numbers, Construction, Dedekind cuts. [3]
2. Metric space, Open sets, Closed sets, Continuous functions, Completeness, Cantor intersection theorem, Baire category theorem, Compactness, Totally boundedness. Connectedness. [9]
3. Definition and existence of Riemann-Stieltjes integral, Properties of the integral, Differentiation and integration. Sequence and series, Uniform convergence, Uniform convergence and continuity, Uniform convergence and integration, Uniform convergence and differentiation [10]
4. Inequalities involving complex numbers, Limit, Continuity and differentiability, Cauchy-Riemann equations, Analytic functions, Polynomials, Rational functions, Harmonic conjugates, Elementary functions, Conformal mapping, Linear transformation. [10]
5. Line integrals, Cauchy's theorem, closed curve, Cauchy's integral formula, Higher derivatives, Morera's theorem, Liouville's theorem, Power series expansions, The Weierstrass theorem, Taylor's Theorem, Laurent's Theorem, Classification of singularities, Classical theorem of Weierstrass concerning behavior of a function in the neighborhood of an essential singularity, zeros of analytic functions, The maximum principle, Schwarz's lemma, Residue theorem and applications. [10]

Text Books

1. **W. Rudin**, Principles of Mathematical Analysis, 3rd ed., McGraw-Hill, 1983.
2. **T. Apostol**, Mathematical Analysis, 2nd ed., Narosa Publishers, 2002.

Reference Books

1. **Lars V. Ahlfors**, Complex Analysis, McGraw-Hill International Editions.
2. **J.B. Conway**, Functions of one complex variable, Narosa, New Delhi.
3. **T.W. Gamelin**, Complex Analysis, Springer International Edition, 2001.
4. **R.V. Churchill and J.W. Brown**, Complex Variables and Applications, Wiley.