

Lecture Plan		
Name of the College: Government College of Arts, Science and Commerce, Sanquelim-Goa		
Name of Faculty: Rohit R. Redkar	Subject: Mathematics	
Paper code: MAT-5003 Advanced Complex Analysis	Program: M.Sc. (Mathematics)	Division: -
Academic year: 2026-27	Semester: I	Total Lectures: 60
Course Objectives: 1. Develop a rigorous understanding of power series and complex functions. 2. Understand and analyze key theorems in complex analysis. 3. Study conformal mappings. 4. Apply the calculus of residues to evaluate complex integrals and improper real integrals.		
Expected Course Outcome: 1) Display familiarity and knowledge of complex functions, power series, conformal mappings, singularities, residues, and associated concepts. 2) Construct and demonstrate rigorous mathematical proofs of key theorems in Advanced Complex Analysis. 3) Choose the appropriate procedures, modify them if needed, and apply them to solve method-based problems in Advanced Complex Analysis. 4) Analyze and solve unseen problems in Advanced Complex Analysis and create mathematically precise arguments to justify their solutions. 5) Prove various results in Riemann integration. 6) Analyze and compare various number theoretic functions. 7) Examine the convergence of improper integrals.		
Student Learning Outcome: Student will be able to		

- 1) Have a skill of proving theorems specifically in Complex Analysis, including results on power series, Cauchy's theorems, and residues.
- 2) Apply the theory of conformal mappings and calculus of residues to evaluate complex and improper integrals.
- 3) Apply the theory of Riemann integration in evaluating integrals.

Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
June	22/06/2026	27/06/2026	4	Uniform Convergence of Power Series		Smart Board PDF	S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
	29/06/2026	04/07/2026	4	Exponential and Trigonometric Functions; Logarithmic Functions		Smart Board PDF	S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
July	06/07/2026	11/07/2026	4	Curves in the complex plane; properties of complex line integrals		Smart Board	S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
	13/07/2026	18/07/2026	4	Cauchy–Goursat Theorem; consequences of simple connectivity			S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.

	20/07/2026	25/07/2026	4	Winding number of a curve; Homotopic version of Cauchy's Theorem		Data projector	S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
Jul/Aug	27/07/2026	01/08/2026	4	Cauchy Integral Formula; Taylor's Theorem			S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
August	03/08/2026	08/08/2026	4	Zeroes of analytic functions; Laurent's Theorem		Smart Board PDF	S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
	10/08/2026	15/08/2026	4	Maximum Modulus Principle and Minimum Modulus Theorem		Smart Board	S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
	17/08/2026	22/08/2026	4	Schwarz Lemma and its consequences; zeroes of certain polynomials			S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
	24/08/2026	29/08/2026	4	Conformal Mappings: principle of conformal mapping; basic properties and fixed points of Möbius maps; triples to triples; cross ratio and its invariance; principle of symmetry		Smart Board PDF	S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.

August/Sep t	31/08/2026	05/09/2026	4	Classification of Singularities: isolated and non-isolated singularities; removable singularities; poles			S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
Sep	07/09/2026	12/09/2026	4	Isolated singularities at infinity; meromorphic functions; essential singularities and Picard's Theorem		Smart Board	S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
	14/09/2026	19/09/2026	0	Ganesh Chaturthi Break (14–19 Sep)			S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
	21/09/2026	26/09/2026	4	Residues: residue at a point and at infinity; Residue Theorem		Smart Board	S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
Sep/Oct	28/09/2026	03/10/2026	3	Argument Principle – number of zeroes and poles; Rouché's Theorem; Open Mapping Theorem			S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
Oct	05/10/2026	10/10/2026	4	Definite integrals involving sines and cosines; evaluation of improper integrals			S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.

12/10/2026	14/10/2026	1	Singularities along the real axis; integrating along branch cuts; estimation of sums			S. Ponnusamy, Foundations of Complex Analysis, 2nd Ed., Narosa Publishing House, 2005.
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* Assessment Rubrics

Component	Max Marks
ISA 1	15
Midpoint Exam	30
ISA 2	15
Practical	Nil
Project	Nil
Semester End Exam	40