

WEEKLY PROGRAMME

First Week

June 13th Chapter I: The Complex Plane and the Elementary Functions

- a. Complex numbers, polar representation
- b. Power and Square Root functions
- c. Exponential and Logarithm functions
- d. Trigonometric and Hyperbolic functions

June 14th Chapter II: Analytic Functions

- a. Analytic functions
- b. The Cauchy-Riemann Equations
- c. Inverse mappings and Jacobian
- d. Harmonic functions
- e. Conformal mappings
- f. Fractional Linear Transformations

June 15th Chapter III: Line Integrals and Harmonic Functions

- a. Line integrals and Green's Theorem
- b. Independence of path
- c. Harmonic conjugates
- d. The mean value property and the maximum principle

June 16th Chapter IV: Complex Integration and Analyticity

- a. Cauchy's Theorem
- b. Liouville's Theorem
- c. Morera's Theorem
- d. Goursat's Theorem

June 17th Problem Session

Second Week

June 19th Chapter V: Power Series

- a. Power Series Expansion of Analytic Functions
- b. Zeros of Analytic Functions / Uniqueness principle
- c. Analytic Continuation

June 20th Chapter VI-VII: Laurent Series, Singularities and Residue

- a. Laurent Decomposition
- b. Isolated Singularities
- c. Residue Theorem
- d. Definite Integral Computations by Residue Theorem

June 21th Chapter VIII: Logarithmic Integral

- a. Argument Principle
- b. Rouché's Theorem
- c. Hurwitz Theorem
- d. Open Mappings and Inverse Function Theorem

June 22th Selected Topics

- a. Schwarz Lemma
- b. Schwarz Reflection Principle
- c. Riemann Mapping Theorem
- d. Compact families of Meromorphic functions- Montel's Theorem
- e. Approximations - (Runge and Mittag-Leffler Theorems)
- f. Introduction to Several Complex Variables (Domains of holomorphy, Hartogs Extension Phenomenon)