

CALIFORNIA STATE UNIVERSITY, SACRAMENTO
Department of Mathematics and Statistics

SYLLABUS

Math 234A and 234B: Complex Analysis

Prerequisite: Math 130B, Math 134 or 105B recommended.

Complex numbers, complex functions, analytic functions, complex integration, harmonic functions, sequences, series, infinite products, conformal mapping, Dirichlet's problem, analytic continuation, entire functions, Riemann Zeta function, normal families.

OUTLINE:

- I. Complex Numbers
 - a. Complex number system
 - b. Complex plane
 - c. Extended complex plane
- II. Elementary Functions
 - a. Powers
 - b. Roots
 - c. Exponential and logarithmic functions
- III. Elementary Point Set Topology
- IV. Analytic Functions
 - a. Limits, continuity, differentiation
 - b. Elementary theory of power series
 - c. Uniform convergence
 - d. Conformity
 - e. Linear fractional transformation
- V. Complex Integration
 - a. Complex integral
 - b. Cauchy's theorem for triangle, rectangle, disk
 - c. Cauchy's integral Formula
 - d. Local properties of analytic functions
 - e. General form of Cauchy's Theorem
 - i. Index of a point with respect to a closed curve
 - ii. Chains and cycles
 - iii. Homology
 - f. Calculus of residues

- VI. Harmonic Functions
 - a. Mean-value property
 - b. Poisson's formula
 - c. Schwarz's theorem
 - d. Reflection principle

- VII. Power series
 - a. Weierstrass' theorem
 - b. Taylor series
 - c. Laurent series

- VIII. Entire Function
 - a. Jensen's formula
 - b. Hadamard's theorem

- IX. Conformal Mapping of Polygons
 - a. Schwarz-Christoffel formula
 - b. Mapping on a rectangle

- X. Dirichlet Problem

- XI. Analytic Continuation
 - a. Analytic continuation along arch
 - b. Homotopic curves
 - c. The Monodromy theorem

- XII. Riemann Zeta Function

- XIII. Families
 - a. Equicontinuity
 - b. Normality and compactness
 - c. Arzela's theorem
 - d. Families of analytic functions