

DSC-18: Complex Analysis

Week 1: Functions of a complex variable and mappings.

[1]: Chapter 2 (Sections 13, and 14).

Week 2: Limits, Theorems on limits, Limits involving the point at infinity.

[1]: Chapter 2 (Sections 15 to 17).

Week 3: Continuity and differentiation.

[1]: Chapter 2 (Sections 18 to 20).

Week 4: Cauchy-Riemann equations and examples, Sufficient conditions for differentiability, Analytic functions and their examples.

[1]: Chapter 2 (Sections 21, 22, 23, 25, and 26).

Week 5: Exponential, logarithmic, and trigonometric functions.

[1]: Chapter 3 (Sections 30, 31, 37, and 38).

Week 6: Derivatives of functions, Definite integrals of functions, Contours.

[1]: Chapter 4 (Sections 41, 42, and 43).

Week 7: Contour integrals and examples, Upper bounds for moduli of contour integrals.

[1]: Chapter 4 (Sections 44, 45, and 47).

Week 8: Antiderivatives, and proof of the antiderivative theorem.

[1]: Chapter 4 (Sections 48, and 49).

Weeks 9 and 10: Cauchy-Goursat theorem (without proof), Cauchy integral formula and its extension with consequences; Liouville's theorem and the fundamental theorem of algebra.

[1]: Chapter 4 (Sections 50, 52 to 58).

Weeks 11 and 12: Taylor and Laurent series with examples.

[1]: Chapter 5 (Overview of Sections 60 and 61).

[1]: Chapter 5 (Sections 62 to 66, and 68).

Week 13: Absolute and uniform convergence of power series, Integration, differentiation and uniqueness of power series.

[1]: Chapter 5 (Sections 69, 71, and 72).

Week 14: Isolated singular points, Residues, Cauchy's residue theorem, Residue at infinity, Types of isolated singular points.

[1]: Chapter 6 (Sections 74 to 79).

Week 15: Residues at poles and its examples, An application to evaluate definite integrals involving sines and cosines.

[1]: Chapter 6 (Sections 80, and 81).

[1]: Chapter 7 (Section 92).

Essential Reading

1. Brown, James Ward, & Churchill, Ruel V. (2014). Complex Variables and Applications (9th ed.). McGraw-Hill Education. Indian Reprint.