Independent Study - Methods in Applied Mathematics
Syllabus
Fall 2021
Worcester Polytechnic Institute
B.S. Tilley

Schedule of topics to cover, based on Keener [4]. Friedman [3], and Stakgold [2] will be additional references.

- Finite Dimensional Vector Spaces (1 week)

- Function Spaces (1 week)

- Integral Equations (2 weeks)

- Differential Operators (2 weeks)

  - Delta function
  - Green's functions
  - Adjoint of an operator
  - Fredholm Alternative Theorem
  - Eigenfunction Expansions

- Review of Complex Variable Theory (2 weeks)

  - Analytic functions
  - Integration
  - Cauchy Integral Formula
  - Taylor/Laurent Series

- Conformal Maps

- Free-boundary problems (Hodograph Transformation)

- Contour integration

- Transform and Spectral Theory (2 weeks)

- Partial Differential Equations (3 weeks)

  - Heat, Wave, Laplace
  - Separation of Variables
  - Fundamental solutions
  - Method of images
  - Transform methods

Every two weeks, a homework assignment will be given and a clean, written set of solutions will be collected before the next assignment is given. The final grade is based on the average grade of these assignments.

References

[1] R.V. Churchill, Complex Variables and Applications, McGraw-Hill

[2] I. Stakgold, Green's Functions and Boundary Value Problems, Second Edition, Wiley Interscience, 1998.

[3] B. Friedman, Principles and Techniques of Applied Mathematics, Dover, 1990.

[4] J.P. Keener, Principles of Applied Mathematis: Transformation and Approximation, Addison Wesley, 1988.