

**MOREHOUSE COLLEGE  
DEPARTMENT OF MATHEMATICS**

**APPLIED MATHEMATICS I  
MATH 325**

**Prerequisite:** Math 263(Cal III) and Math 321 (ODE) with grades of “C” or better

**Text:** Boundary Value Problems, 5th Ed., by David L. Powers (Elsevier Academic Press, 2006)

**Coverage:** Chapters 0 – 4, 6.

---

**COURSE OUTLINE**

**CHAPTER 0. Ordinary Differential Equations**

- 0.1 Homogeneous Linear Equations
- 0.2 Non-homogeneous Linear Equations
- 0.3 Boundary Value Problems
- 0.4 Singular Boundary Value Problems
- 0.5 Green’s Functions

**CHAPTER 1. Fourier Series and Integrals**

- 1.1 Periodic Functions and Fourier Series
- 1.2 Arbitrary Period and Half-Range Expansions
- 1.3 Convergence of Fourier Series
- 1.4 Uniform Convergence
- 1.5 Operations on Fourier Series
- 1.6 Mean Error and Convergence in Mean
- 1.7 Proof of Convergence
- 1.8 Numerical Determination of Fourier Coefficients
- 1.9 Fourier Integral
- 1.10 Complex Methods
- 1.11 Applications of Fourier Series and Integrals

**CHAPTER 2. The Heat Equation**

- 2.1 Derivation and Boundary Conditions
- 2.2 Steady-State Temperatures
- 2.3 Example: Fixed End Temperatures
- 2.4 Example: Insulated Bar
- 2.5 Example: Different Boundary Conditions
- 2.6 Example: Convection
- 2.7 Sturm-Liouville Problem
- 2.8 Expansion in Series of Eigenfunctions
- 2.9 Generalities on the Heat Conduction Problem
- 2.10 Semi-infinite Rod
- 2.11 Infinite Rod
- 2.12 The Error Function

**CHAPTER 3. The Wave Equation**

- 3.1 The Vibrating String
- 3.2 Solution of the Vibrating String Problem
- 3.3 d’Alembert’s Solution
- 3.4 One-dimensional Wave Equation: Generalities
- 3.5 Estimation of Eigenvalues
- 3.6 Wave Equation in Unbounded Regions

## **CHAPTER 4. The Potential Equation**

- 4.1 Potential Equation
- 4.2 Potential in a Rectangle
- 4.3 Further Examples for a Rectangle
- 4.4 Potential in Unbounded Regions
- 4.5 Potential in a Disk
- 4.6 Classification and Limitation

## **CHAPTER 6. Laplace Transform**

- 6.1 Definition and Elementary Properties
- 6.2 Partial Fractions and Convolutions
- 6.3 Partial Differential Equations
- \*6.4 More Difficult Examples

---

A syllabus is not a contract between instructor and students. The instructor reserves the right to alter, based on new materials, class discussions, or other legitimate pedagogical objectives. Morehouse College is committed to equal opportunity in education for all students, including those with documented disabilities. Students with disabilities or those who suspect they have a disability must register with the Office of Disability Services ("ODS") in order to receive accommodations. Students currently registered with the ODS are required to present their Disability Services Accommodation Letter to faculty immediately upon receiving the accommodation. If you have any questions, contact the Office of Disability Services, 104 Sale Hall Annex, Morehouse College, 830 Westview Dr. S.W., Atlanta, GA 30314, (404) 215-2636, FAX: (404) 215-2749.