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 (Elsvier 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 Interal
- 1.10 Complex Methods
- 1.11 Applications of Fourier Series and Ingerals

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 Deferential Equations
*6.4 More Difficult Examples
