

**MATH 4510/5510-Advanced Mathematics for Engineers**  
3 Semester Hours

**Catalog Data: Math 4510(5510)** Advanced Mathematics for Engineers. Credit 3.  
Fourier Series, Sturm-Liouville Problems, Orthogonal Functions, Bessel Equations, Legendre Equations, Separable Partial Differential Equations (e.g. Heat, Wave, and Laplace Equations), and Other Topics.

**Textbook:**

Dennis G. Zill and Michael R. Cullen, Differential Equations with Boundary-Value Problems, seventh edition, Brooks/Cole, 2009.

**Goals:** This course is designed to introduce the student to Fourier Series, the method of solution of partial differential equations by separation of variables, and the application of these techniques to certain problem of mathematical physics and engineering.

**Prerequisites :** "C" or better in MATH 2110 and MATH 2120

Chapter 6 Series Solutions of Linear Equations 6 class periods

- 6.1 Solutions about Ordinary Points
- 6.2 Solutions about Singular Points
- 6.3 Special Equations

Chapter 11 Orthogonal Functions and Fourier Series 9 class periods

- 11.1 Orthogonal Functions
- 11.2 Fourier Series
- 11.3 Fourier Cosine and Sine Series
- 11.4 Sturm-Liouville Problem
- 11.5 Bessel and Legendre Series

Chapter 12 Boundary-Value Problems  
in Rectangular Coordinates 16 class periods

- 12.1 Separable Partial Differential Equations
- 12.2 Classical PDEs and Boundary-Value Problems
- 12.3 Heat Equation
- 12.4 Wave Equation
- 12.5 Laplace's Equation
- 12.6 Nonhomogeneous Boundary-Value Problems
- 12.7 Orthogonal Series Expansions
- 12.8 Higher-Dimensional Problems

Chapter 13 Boundary-Value Problems in Other Coordinate Systems      6 class periods

- 13.1 Polar Coordinates
- 13.2 Polar and Cylindrical Coordinates
- 13.3 Spherical Coordinates

Chapter 14 Integral Transform Method [Optional]

selected sections as time permits

Students with a disability requiring accommodations should contact the Office of Disability Services (ODS). An Accommodation Request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The ODS is located in the Roaden University Center, Room 112; phone 372-6119.

Last Revised: 01/25/10