

**Tennessee Technological University
Mathematics Department**

MATH 4510/5510-Advanced Mathematics for Engineers

I. COURSE DESCRIPTION FROM CATALOG:

Fourier series, partial differential equations, method of Frobenius, Gamma function, Bessel functions, orthogonal polynomials, Sturm-Liouville equations plus other topics. Lec. 3. Cr. 3.

II. PREREQUISITE(S):

"C" or better in MATH 2110 and MATH 2120.

III. COURSE OBJECTIVE(S):

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 problems of mathematical physics and engineering.

IV. TOPICS TO BE COVERED:

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 Partial Differential Equations and
Boundary-Value Problems in Rectangular Coordinates 16 class periods

12.1 Separable Partial Differential Equations

12.2 Classical Equations and Boundary-Value Problems

12.3 Heat Equation

12.4 Wave Equation

12.5 Laplace's Equation

12.6 Nonhomogeneous Equations and Boundary Conditions

12.7 Orthogonal Series Expansion

12.8 Higher-Dimensional Problems

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.

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

V. POSSIBLE TEXTS AND REFERENCES:

Zill, Differential Equations with Boundary Value Problems, 6th Edition,
Brooks/Cole, 2005.

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