Tennessee Technological University
Mathematics Department

MATH 6610: Operational Mathematics

I. COURSE DESCRIPTION FROM CATALOG:

Integral transforms (Laplace, Fourier) inversion and convolution theorems, applications. Lec. 3. Cr. 3.

II. PREREQUISITE(S): Consent of instructor

III. COURSE OBJECTIVE(S):

A study of integral transforms, especially the Laplace and Fourier transforms. Topics include definitions, basic formulas, relations, operational properties, complex analysis and integration, inversion formulas, and solutions of ordinary and partial differential equations.

IV. STUDENT LEARNING OUTCOMES:

Upon successful completion of this course, a student will

1. Understand basic definitions and operational properties of the Laplace transform. The student will be able to find the Laplace transform of various standard functions and the associated inverse Laplace transforms.
2. Be able to solve many linear ordinary differential equations, such as those governing the motion of a vibrating string, using the Laplace transform.
3. Be able to solve various partial differential equations, such as the wave equation and the heat equation, using the Laplace transform.
4. Master the basics of complex analysis and complex integration to be able to carry out the inversion integral for finding inverse Laplace transforms, and use this knowledge to find solutions of more difficult partial differential equations.
5. Understand basic definitions and operational properties of the exponential Fourier transform, the Fourier cosine transform, and the Fourier sine transform, as applied to various standard functions, and use this knowledge to solve certain ordinary and partial differential equations.

V. TOPICS TO BE COVERED:

Chapter 1: The Laplace Transformation
Chapter 2: Further Properties of the Transformation
Chapter 3: Elementary Applications
Chapter 4: Problems in Partial Differential Equations
Chapter 5: Functions of a Complex Variable
Chapter 6: The Inversion Integral
Chapter 7: Problems in Heat Conduction
Chapter 8: Problems in Mechanical Vibrations
Chapter 12: Exponential Fourier Transforms
Chapter 13: Fourier Transforms on the Half Line

VI. ADDITIONAL INFORMATION:

VII. POSSIBLE TEXTS AND REFERENCES:

Operational Mathematics,3rd edition, by Ruel V. Churchill

VIII. ANY TECHNOLOGY THAT MAY BE USED:

IX. STUDENT ACADEMIC MISCONDUCT POLICY

Maintaining high standards of academic integrity in every class at Tennessee Tech is critical to the reputation of Tennessee Tech, its students, alumni, and the employers of Tennessee Tech graduates. The Student Academic Misconduct Policy describes the definitions of academic misconduct and policies and procedures for addressing Academic Misconduct at Tennessee Tech. For details, view the Tennessee Tech's Policy 217 – Student Academic Misconduct at Policy Central.

X. DISABILITY ACCOMMODATION

Students with a disability requiring accommodations should contact the Accessible Education Center (AEC). An Accommodation Request (AR) should be completed as soon as possible, preferably by the end of the first week of the course. The AEC is located in the Roaden University Center, Room 112; phone 931-372-6119. For details, view the Tennessee Tech's Policy 340 – Services for Students with Disabilities at Policy Central.